



Utilitiesman (Advanced)

Only one answer sheet is included in the NRTC. Reproduce the required number of sheets you need or get answer sheets from your ESO or designated officer.

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0503LP4803800

Although the words "he," "him," and "his" are used sparingly in this manual to enhance communication, they are not intended to be gender driven nor to affront or discriminate against anyone reading this material.

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Specific Instructions and Errata for
Nonresident Training Course

UTILITIESMAN ADVANCED, NAVEDTRA 82534

1. No attempt has been made to issue corrections for errors in typing, punctuation, etc., that do not affect your ability to answer the question or questions.
2. To receive credit for deleted questions, show this errata to your local course administrator (ESO/scorer). The local course administrator is directed to correct the course and the answer key by indicating the questions deleted.
3. Assignment Booklet, NAVEDTRA 82534.

Delete the following questions, and leave the corresponding spaces blank on the answer sheets:

Questions

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UTILITIESMAN (ADVANCED)

NAVEDTRA 82534

Prepared by the Naval Education and Training Program Management
Support Activity, Pensacola, Florida

Congratulations! By enrolling in this course, you have demonstrated a desire to improve yourself and the Navy. Remember, however, this self-study course is only one part of the total Navy training program. Practical experience, schools, selected reading, and your desire to succeed are also necessary to successfully round out a fully meaningful training program. You have taken an important step in self-improvement. Keep up the-good work.

HOW TO COMPLETE THIS COURSE SUCCESSFULLY

ERRATA: If an errata comes with this course, make all indicated changes or corrections before you start any assignment. Do not change or correct the Training Manual (TRAMAN) or assignments in any other way.

TEXTBOOK ASSIGNMENTS: The TRAMAN for this course is *UTILITIESMAN (ADVANCED)*, NAVEDTRA 12534. The TRAMAN pages that you are to study are listed at the beginning of each assignment. Study these pages carefully before attempting to answer the questions in the course. Pay close attention to tables and illustrations because they contain information that will help you understand the text. Read the learning objectives provided at the beginning of each chapter or topic in the text and/or preceding each set of questions in the course. Learning objectives state what you should be able to do after studying the material. Answering the questions correctly helps you accomplish the objectives.

BLACK DOT INFORMATION: Black dots (●) may be used in the text and correspondence course to emphasize important or supplemental information and to highlight instructions for answering certain questions. Read these black dot entries carefully; they will help you answer the questions and understand the material.

SELECTING YOUR ANSWERS: After studying the TRAMAN, you should be ready to answer the questions in the assignment. Read each question carefully, then select the BEST answer. Be sure to select your answer from the subject matter in the TRAMAN. You may refer freely to the TRAMAN and seek advice and information from others on problems that may arise in the course. However, the answers must be the result of your own work and decisions. You are prohibited from referring to or copying the answers of others and from giving answers to anyone else taking the same course. Failure to follow these rules can result in suspension from the course and disciplinary action.

SUBMITTING COMPLETED ANSWER SHEETS: Complete all assignments as quickly as possible to derive maximum benefit from the course. As a minimum, you must submit at least one assignment per month. This is a requirement established by the Chief of Naval Education and Training. Failure to meet this requirement could result in disenrollment from the course.

TYPES OF ANSWER SHEETS: If you are a U.S. Navy enlisted member on active duty or a drilling U.S. Naval Reserve enlisted member, you should use the answer sheet attached at the end of this course and follow the instructions in section A below. If you are an enlisted U.S. Naval Reserve member who is not attached to

a drilling unit or if you are an officer, a civilian, or a member of the U.S. Army, Air Force, Marine Corps, or Coast Guard, you should use the Automatic Data Processing (ADP) answer sheets included in the course package and follow the instructions in section B.

A. Manually Scored Answer Sheets

If you are a U.S. Navy enlisted member on active duty or attached to a U.S. Naval Reserve drilling unit, your course will be administered by your local command. You must use the answer sheet designed for manual scoring, NETPMSA form 1430/5, Stock Ordering Number 0502-LP-216-0100. You may get a supply of the forms from your Educational Services Officer (ESO), or you may reproduce the one in the back of this course booklet. DO NOT USE THIS FORM FOR COURSES ADMINISTERED BY NETPMSA.

Recording Information on the Manually Scored Answer Sheets: As you complete each assignment, submit the completed answer sheet to your ESO for grading. You may submit more than one answer sheet at a time. Remember, you must submit at least one assignment each month.

Grading: Your ESO will grade each answer sheet and notify you of any incorrect answers. The passing score for each assignment is 3.2. If you receive less than 3.2 on any assignment, the ESO will list the questions you answered incorrectly and give you an answer sheet marked "RESUBMIT." You must redo the assignment and complete the RESUBMIT answer sheet. The maximum score you can receive for a resubmitted assignment is 3.2.

Course Completion: After you have submitted all the answer sheets and have earned at least 3.2 on each assignment, your command should give you credit for this course by making the appropriate entry in your service record.

Student Questions: If you have questions concerning the administration of this course, consult your ESO.

B. ADP Answer Sheets

If you are an enlisted U.S. Naval Reserve member who is not attached to a drilling reserve unit or if you are an officer, a civilian, or a member of the U.S. Army, Air Force, Marine Corps, or Coast Guard, use the ADP answer sheets provided in your course package. You should use one blank original ADP answer sheet for each assignment. Use only the original ADP answer sheet provided in your course package; NETPMSA will not accept reproductions.

Recording Information on the ADP Answer Sheets: Follow the "MARKING INSTRUCTIONS" on each answer sheet. Be sure that blocks 1, 2, and 3 are filled in correctly. This information is necessary for your course to be properly processed and for you to receive credit for your work.

As you work the course, be sure to mark your answers in the course booklet because your answer sheets will not be returned to you. When you have completed an assignment, transfer your answer from the course booklet to the answer sheet.

Mailing the Completed ADP Answer Sheets: Upon completing an assignment, mail the completed answer sheet to:

COMMANDING OFFICER
NETPMSA CODE 036
6490 SAUFLEY FIELD RD
PENSACOLA FL 32559-5000

Use envelopes to mail your answer sheets. You must provide your own envelopes or request them from your ESO. You may enclose more than one answer sheet in a single envelope. Remember, regardless of how many answer sheets you submit at a time, NETPMSA should receive at least one assignment a month.

NOTE: DO NOT USE THE COURSE COMMENTS PAGE AS AN ENVELOPE FOR RETURNING ANSWER SHEETS OR OTHER COURSE MATERIALS.

Grading: NETPMSA will grade the answer sheets and notify you by letter concerning your grade for each assignment, your incorrect answers, and your final grade. The passing score for each assignment is 3.2. If you receive less than 3.2 on any assignment, you must rework the assignment. NETPMSA will enclose a new ADP answer sheet in the letter notifying you of the questions you answered incorrectly. You will be required to redo the assignment and resubmit the new answer sheet. The maximum score you can receive for a resubmitted assignment is 3.2.

Course Completion: When you complete the last assignment, fill out the "Course Completion" form in the back of the course and enclose it with your last answer sheet. NETPMSA will issue you a letter certifying that you satisfactorily completed the course. You should make sure that credit for the course is recorded in your service record. YOU MAY RETAIN THE TEXT.

NOTE: YOUR OFFICIAL COURSE COMPLETION DATE WILL BE THE DATE YOUR LAST ASSIGNMENT IS PROCESSED THROUGH THE NETPMSA ADP SYSTEM--NOT THE DATE YOU DEPOSIT THE LAST ASSIGNMENT IN THE MAIL. This is especially important if you are taking the course for Naval Reserve retirement credit. You must mail your answer sheets at least 60 days before your anniversary date. This will provide you with enough time for delays in the mail or reworking failed assignments. DO NOT MAIL YOUR ASSIGNMENTS TO THE NAVAL RESERVE PERSONNEL COMMAND (NRPC).

Student Questions: Refer questions concerning this course to NETPMSA by mail (use the address on page ii) or by telephone: DSN 922-1366 or commercial (904) 452-1366.

NAVAL RESERVE RETIREMENT CREDIT

If you are a member of the Naval Reserve, you will receive retirement points if you are authorized to receive them under current directives governing retirement of Naval Reserve personnel. For the purpose of Naval Reserve retirement, this edition of the course is evaluated at 12 points. These points will be credited to you upon your satisfactory completion of the assignments.

NOTE: YOUR OFFICIAL COURSE COMPLETION DATE WILL BE THE DATE YOUR LAST ASSIGNMENT IS PROCESSED THROUGH THE NETPMSA ADP SYSTEM--NOT THE DATE YOU DEPOSIT THE LAST ASSIGNMENT IN THE MAIL. Refer to the Course Completion paragraph under section B. ADP Answer Sheets.

COURSE OBJECTIVES

In completing this Nonresident Training Course (NRTC), you will demonstrate a knowledge of the subject matter by correctly answering questions on the following: Blueprint Reading and Technical Drawings; Planning, Estimating and Scheduling; Planning Plumbing Projects; Fire Protection Systems; Water Treatment and Purification; Sewage Treatment and Disposal; Compressed Air Systems; Boilers; Duct and Ventilation Systems; Air Conditioning and Refrigeration; and Environmental Pollution Control.

Naval courses may include several types of questions--multiple-choice, true-false, matching, etc. The questions are not grouped by type but by subject matter. They are presented in the same general sequence as the textbook material upon which they are based. This presentation is designed to preserve continuity of thought, permitting step-by-step development of ideas. Not all courses use all of the types of questions available. The student can readily identify the type of each question, and the action required, by inspection of the samples given below.

MULTIPLE-CHOICE QUESTIONS

Each question contains several alternatives, one of which provides the best answer to the question. Select the best alternative, and blacken the appropriate box on the answer sheet.

SAMPLE

- s-1. Who was the first person appointed Secretary of Defense under the National Security Act of 1947?

1. George Marshall
2. James Forrestal
3. Chester Nimitz
4. William Halsey

Indicate in this way on the answer sheet:

	1	2	3	4
	T	F		
s-1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _ _ _

TRUE-FALSE QUESTIONS

Mark each statement true or false as indicated below. If any part of the statement is false the statement is to be considered false. Make the decision, and blacken the appropriate box on the answer sheet.

SAMPLE

- s-2. All naval officers are authorized to correspond officially with any systems command of the Department of the Navy without their respective commanding officer's endorsement.

1. True
2. False

Indicate in this way on the answer sheet:

	1	2	3	4
	T	F		
s-2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _ _ _

MATCHING QUESTIONS

Each set of questions consists of two columns, each listing words, phrases or sentences. The task is to select the item in column B which is the best match for the item in column A that is being considered. Items in column B may be used once, more than once, or not at all. Specific instructions are given with each set of questions. Select the numbers identifying the answers and blacken the appropriate boxes on the answer sheet.

SAMPLE

In questions s-3 through s-6, match the name of the shipboard officer in column A by selecting from column B the name of the department in which the officer functions. Some responses may be used once, more than once, or not at all.

A. OFFICER

B. DEPARTMENT

Indicate in this way on the answer sheet:

- | | | |
|------|--------------------------|---------------------------|
| s-3. | Damage Control Assistant | 1. Operations Department |
| s-4. | CIC Officer | 2. Engineering Department |
| s-5. | Disbursing Officer | 3. Supply Department |
| s-6. | Communications Officer | |

	1	2	3	4
	T	F		
s-3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _ _ _
s-4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _ _ _
s-5	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> _ _ _
s-6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _ _ _

ASSIGNMENT 1

Textbook Assignment: "Blueprint Reading and Technical Drawings." Pages 4-1 through 4-13. "Planning Plumbing Projects. " Pages 7-1 through 7-18.

- | | |
|---|---|
| <p>1-1. What factor is generally used to categorize a drawing?</p> <ol style="list-style-type: none">1. Importance2. Purpose3. Methodology4. Format <p>1-2. During what phase of a building project is the preliminary drawing prepared?</p> <ol style="list-style-type: none">1. Design2. Scheduling3. Fabrication4. Construction <p>1-3. What category of drawing is used to make material selections?</p> <ol style="list-style-type: none">1. Construction2. Secondary3. Preliminary4. Engineering <p>1-4. Shop and working drawings are developed at which of the following times?</p> <ol style="list-style-type: none">1. Before developing secondary drawings2. After receiving the engineering drawings3. Before developing the preliminary drawings4. After receiving approval for construction <p>1-5. Construction plans are developed from what type of drawing?</p> <ol style="list-style-type: none">1. Architectural2. Secondary3. Preliminary4. Engineering <p>1-6. Which of the following individuals designs the power and lighting system requirements for a project?</p> <ol style="list-style-type: none">1. Engineer2. Architect3. Designer4. Customer | <p>1-7. As a supervisor, you should refer to what documents as the chief source(s) of information during a construction project?</p> <ol style="list-style-type: none">1. Construction drawings2. Project specifications3. Bill of materials4. Each of the above <p>1-8. Construction prints are used to express ideas easier and faster. They are also used by the supervisor for which of the following reasons?</p> <ol style="list-style-type: none">1. To evaluate personnel2. To monitor construction progress3. To determine the necessary construction methods4. To determine the electrical load of the building <p>1-9. The waterline stub outs, located on the right side of figure 4-1C, are supplying what fixture?</p> <ol style="list-style-type: none">1. Tub2. Water closet3. Cleanout4. Lavatory <p>1-10. What type of line is used to show the center of a line or fitting?</p> <ol style="list-style-type: none">1. Stitch2. Cutting3. Center4. Visible |
|---|---|

IN ANSWERING QUESTIONS 1-11 THROUGH 1-15, SELECT FROM COLUMN B THE TYPE OF LINE THAT MATCHES THE DEFINITION IN COLUMN A. RESPONSES MAY BE USED MORE THAN ONCE.

A. <u>DEFINITIONS</u>	B. <u>TYPES OF LINES</u>
1-11. Indicates concealed edges	1. Extension 2. Dimension
1-12. Indicates distance measured	3. Hidden 4. Leader
1-13. Indicates extent of a dimension	
1-14. Indicates a part, dimension, or reference	
1-15. Indicates medium lines with short, evenly spaced dashes	
<hr/>	
1-16. In the preparation of electrical drawings, engineers use symbols adopted by what authority?	
	1. National Association of Architects and Engineers 2. American Engineering Society 3. American National Standards Institute 4. National Institute of Construction Engineers
1-17. Blueprints have a symbol list or legend for which of the following reasons?	
	1. Because engineers modify existing symbols to fit their needs 2. Because standard electrical symbols cannot be used on military projects 3. Because it is required by labor unions 4. Because few symbols are recognized nationwide
1-18. What type of plan shows the spot where a building is to be placed on a piece of land?	
	1. Architectural 2. Plot 3. Foundation 4. Engineering

- 1-19. To determine the point where service taps should be connected, you should use which of the following plans?
1. Elevation
 2. Floor
 3. Foundation
 4. Plot
- 1-20. Exterior elevation drawings help when you are installing which of the following components?
1. Lavatories
 2. Rough-in piping
 3. Hose bibs
 4. Drains
- 1-21. You are installing a lavatory in a bathroom counter. Which of the following drawings indicates the water supply stub outs?
1. Framing
 2. Site
 3. Floor
 4. Interior elevation
- 1-22. When the actual length of a pipe run is 80 feet, what is the length of its line on a blueprint with a scale of 1 /8 inch = 2 feet?
1. 5 inches
 2. 7 inches
 3. 3 inches
 4. 10 inches
- 1-23. The distance between two fixtures drawn on a blueprint is 3 inches long. What is the actual distance between the fixtures if the print is drawn with a scale of 1/2 inch = 3 feet?
1. 6 feet
 2. 9 feet
 3. 18 feet
 4. 24 feet
- 1-24. What is the bill of material for a project?
1. A listing of material by cost
 2. A listing of project specifications
 3. A statement of required material
 4. A listing of defective requisition line items

TYPES OF ELECTRICAL DIAGRAMS

- A. Connection
- B. Wiring
- C. Block
- D. Schematic

Figure 1A

IN ANSWERING QUESTIONS 1-25 THROUGH 1-29, REFER TO FIGURE 1A.

- 1-25. Shows relationship of major components:
- 1. A
 - 2. B
 - 3. C
 - 4. D
- 1-26. Shows the electrical operation:
- 1. A
 - 2. B
 - 3. C
 - 4. D
- 1-27. Shows all internal and external connections:
- 1. D
 - 2. C
 - 3. B
 - 4. A
- 1-28. Portrays a picturelike drawing:
- 1. D
 - 2. C
 - 3. B
 - 4. A
- 1-29. Called an elementary or a single-line diagram:
- 1. A
 - 2. B
 - 3. C
 - 4. D
- 1-30. To assist in the installation of a plumbing system, the Utilitiesman should draw what type of document?
- 1. A schematic
 - 2. A working sketch
 - 3. A block diagram
 - 4. A single-line diagram
- 1-31. When drawing a working sketch, you should perform what step first?
- 1. Locate the main cable runs on the drawing
 - 2. Draw the terminal connections
 - 3. Locate the power supply on the drawing
 - 4. Draw the symbols used for components
- 1-32. Specifications set what level of standards for a construction project?
- 1. Minimum
 - 2. Maximum
 - 3. American Engineering Society
 - 4. National Institute of Construction Engineers
- 1-33. Project specifications provide which of the following information?
- 1. Size of materials
 - 2. Quality of materials
 - 3. Generic descriptions of materials
 - 4. Relationship between different materials
- 1-34. Designer intentions about a project can be clarified in the specifications in which of the following ways?
- 1. By adding a detail or note to the drawings
 - 2. By adding detailed, descriptive statements to the specifications
 - 3. By ensuring the material is duplicated in the drawings
 - 4. By using only general statements on construction methods and materials
- 1-35. Ensuring that the operations department receives a marked set of prints showing any construction deviations is the responsibility of what person?
- 1. The project engineer
 - 2. The project supervisor
 - 3. The project Engineering Aid
 - 4. The quality control inspector

- 1-36. Record drawings are prepared from which of the following documents?
1. Original blueprints
 2. Working sketches
 3. As-built drawings
 4. Project specifications
- 1-37. When maintenance on a structure requires a change to the record drawing, you should pass this information to which of the following departments?
1. Quality control
 2. Operations only
 3. Maintenance control only
 4. Operations or maintenance control
- 1-38. What document is used to present notes and information in tabular form?
1. A schedule
 2. A project specification
 3. A material summary sheet
 4. An overall project list
- 1-39. On a plumbing fixture schedule, a Utilitiesman can locate information concerning installation in what column?
1. Type
 2. Remarks
 3. Mounting
 4. Installation
- 1-40. To provide expert advice to crew members, you should be thoroughly familiar with which of the following data?
1. Plumbing codes
 2. Job plans and specifications
 3. Technical references and manufacturers' manuals
 4. Each of the above
- 1-41. What person is responsible for communicating requirements to other companies and departments?
1. The coordinator
 2. The supervisor
 3. The planner
 4. The technical advisor
- 1-42. Which of the following factors determines the type of pipe that should be used in a sanitary system?
1. Building requirements
 2. Waste matter conveyed
 3. Pipe location
 4. Each of the above
- 1-43. What is the minimum allowable horizontal distance between the underground water service and the building drain, in feet?
1. 8
 2. 2
 3. 6
 4. 4
- 1-44. After installation, a building sewer should be pressure-treated with what minimum head of water?
1. 5 feet
 2. 2 feet
 3. 10 feet
 4. 15 feet
- 1-45. So you can obtain the necessary fluid velocity in a sanitary drainage system, what is the minimum amount of slope, in inches per foot, for piping 3 inches or less in diameter?
1. 1/16
 2. 1/8
 3. 1/4
 4. 1/2
- 1-46. Sewer mains installed with the proper grade provide a discharge velocity of not less than how many feet per second?
1. 8
 2. 2
 3. 6
 4. 4
- 1-47. To create an efficient natural scouring action and still allow capacity for peak loads, what should be the flow depth in the optimum size of pipe under normal use?
1. One-fourth full
 2. One-half full
 3. Two-thirds full
 4. Three-fourths full

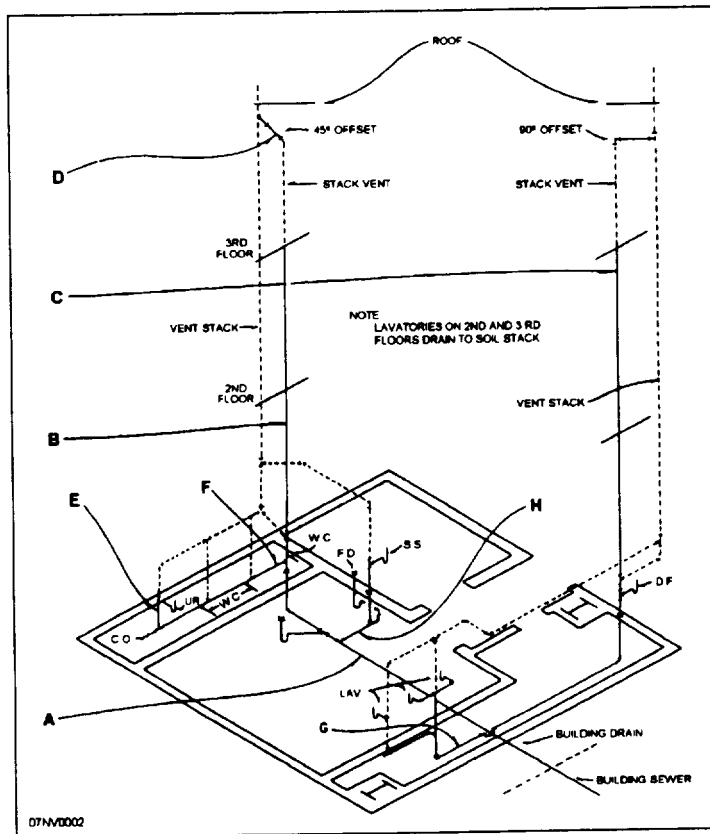


Figure 1 B

THE ANSWERS TO QUESTIONS 1-48 THROUGH 1-59 ARE DERIVED FROM FIGURE 1 B USING THE PROCEDURES DISCUSSED IN THE TEXT. FIGURE 1 B ILLUSTRATES A CAST-IRON DRAINAGE SYSTEM FOR A BUILDING WITH THREE IDENTICAL HEADS, ONE ON EACH OF THREE FLOORS LOCATED DIRECTLY ABOVE EACH OTHER. THE FOLLOWING TYPES OF FIXTURES ARE TO BE USED:

Valve-operated water closet
Siphon jet blowout pedestal urinal
Standard 1 1/4-inch-diameter waste lavatory
Standard 2-inch-diameter waste floor drain
Drinking fountain
Combination sink and tray with a 1 1/2-inch-diameter trap

1-48. What is the total number of drainage fixture units in the installation?

1. 101 1/2
2. 106 1/2
3. 107 1/2
4. 109 1/2

1-49. A pipe of what diameter, in inches, is required for the building drain at point A when installed at a 1 percent-grade?

1. 5
2. 2
3. 3
4. 4

1-50. A total of how many drainage fixture units could be added to the drainage system without requiring an increase in the size of the building drain?

1. 180
2. 93 1/2
3. 73 1/2
4. 60

1-51. A waste stack is indicated at what point?

1. B
2. C
3. D
4. E

- 1-52. A soil stack is indicated at what point?
1. B
 2. C
 3. D
 4. F
- 1-53. What diameter of pipe, in inches, is required at point B?
1. 6
 2. 2
 3. 3
 4. 4
- 1-54. What diameter of pipe, in inches, is required at point D?
1. 6
 2. 2
 3. 5
 4. 4
- 1-55. A pipe of what diameter, in inches, is required at point C?
1. 1 1/4
 2. 2
 3. 1 1/2
 4. 2 1/4
- 1-56. A pipe of what diameter, in inches, is required at point E?
1. 1 1/2
 2. 2
 3. 3
 4. 3 1/2
- 1-57. What diameter of pipe, in inches, is required at point F?
1. 5
 2. 2
 3. 3
 4. 4
- 1-58. A pipe of what diameter, in inches, is required at point G?
1. 1 1/4
 2. 2
 3. 1 1/2
 4. 2 1/4
- 1-59. What diameter of pipe, in inches, is required at point H?
1. 1 1/2
 2. 2
 3. 3 1/2
 4. 4
- 1-60. Which of the following fixtures requires the largest waste pipe?
1. Shower
 2. Trap-to-floor slop sink
 3. Lavatory with a copper tubing waste pipe
 4. Scullery sink with a steel waste pipe
- 1-61. For planning purposes, the size of a sanitary collecting sewer in a residential area is based on which of the following information?
1. Full occupancy of all quarters served
 2. Number of persons employed in an 8-hour period
 3. Average number of contributing persons during a 24-hour period
 4. Allowance for full capacity plus 25 percent
- 1-62. In the sizing of a typical sanitary collecting sewer, what figure is added to the extreme rate of flow to obtain the design flow?
1. The average rate of flow
 2. The differential between average and peak flow
 3. An amount equivalent to the low-flow ratio differential
 4. An allowance for infiltration
- 1-63. Which of the following factors should be considered when you are determining the size of a sewer pipe?
1. Grade
 2. Design flow
 3. Pipe characteristic
 4. Each of the above
- 1-64. Slope is an important part of sewer pipe installation and is, in part, dependent upon the inside diameter of the pipe. What is the minimum slope, in feet per 100 foot, for pipe with an 8-inch inside diameter?
1. 0.60
 2. 0.40
 3. 0.24
 4. 0.14

- 1-65. Flow velocity is an important consideration in designing a sanitary collecting sewer for which of the following reasons?
1. Excessive velocity erodes the sewer pipes
 2. Excessive velocity draws subsurface water into the sewer
 3. Low velocity causes pipe erosion
 4. Low velocity results in soil contamination around the pipes
- 1-66. Manholes for sanitary collecting sewers are normally placed at intervals of 300 to 500 feet. What condition can reduce the interval between two manholes to less than 300 feet?
1. A change in grade or direction
 2. A junction of two or more sewer lines
 3. A change in pipe size
 4. Each of the above
- 1-67. When building storm drains, you should allow for what minimum slope?
1. 1 inch per foot
 2. 1/8 inch per foot
 3. 1/4 inch per foot
 4. 1/2 inch per foot
- 1-68. You should use which of the following factors to determine the size of pipe in a cold-water supply system?
1. Maximum fixture demand
 2. Type of flushing devices
 3. Pressure of the water supply
 4. Each of the above
- 1-69. The term "simultaneous use" as applied to a cold-water supply system and its fixtures has what meaning?
1. Probable percentage of fixtures in use at any given time
 2. Probable percentage of fixtures in use at the same time within a 24-hour period
 3. Approximate amount of water required to supply fixtures used simultaneously over a given period of time
 4. Ratio of persons to fixtures
- 1-70. What is the minimum practical size of a water-service line?
1. 1 inch
 2. 3/8 inch
 3. 1/2 inch
 4. 3/4 inch
- 1-71. Copper pipe is advantageous as a hot-water supply line for which of the following reasons?
1. It retains heat
 2. It is an excellent insulator
 3. It resists corrosion
 4. It is an excellent conductor of heat
- 1-72. You should use a circulating hot-water supply system for which of the following reasons?
1. To conserve energy
 2. To maintain a constant hot-water supply
 3. To assist in heating a building
 4. Each of the above
- 1-73. The corporation stop should be installed in what position?
1. On the water main where a tap is made
 2. On the overhead-feed and gravity-return system
 3. On the highest point of the distribution piping
 4. On the water main in a convenient location
- 1-74. A stop and waste valve is used for what purpose?
1. To secure water to the boiler
 2. To drain the building water system
 3. To secure water at the main
 4. To drain the hot-water heater

ASSIGNMENT 2

Textbook Assignment: "Planning Plumbing Projects" and "Fire Protection Systems." Pages 7-20 through 8-27.

- 2-1. Direct chemical attack over the surface of a metal is known by what term?
1. Galvanic action
 2. Uniform corrosion
 3. Dezincification
 4. Embrittlement
- 2-2. A difference of potential between areas on a metallic surface in contact with an electrolyte causes what condition?
1. Compositional corrosion
 2. Direct chemical attack
 3. Local galvanic action
 4. Uniform corrosion
- 2-3. Corrosion of underground pipelines, resulting from unlike soils and subsurface stray currents, is characterized by what type of deterioration?
1. Localized
 2. Uniform
 3. Nonelectrolytic
 4. Synthetic
- 2-4. In underground pipelines, the mill scale embedded in the wall of iron pipe causes what type of corrosion?
1. Uniform
 2. Localized
 3. Compositional
 4. Biological
- 2-5. Which of the following types of pipe is most susceptible to microbiological corrosive action?
1. Monel
 2. Plastic
 3. Steel
 4. Asbestos
- 2-6. Dezincification, graphitization, and hydrogen embrittlement are what specific type of corrosion?
1. Localized
 2. Compositional
 3. Uniform
 4. Biological
- 2-7. Sections of buried pipelines under stress are subject to localized electrolytic corrosion when adjoining unstressed sections become
1. cathodic
 2. localized
 3. anodic
 4. sacrificial
- 2-8. Nonelectrolytic gases and vapors cause corrosion only when subjected to what condition?
1. Low temperatures
 2. Negative potentials
 3. High temperatures
 4. Positive potentials
- 2-9. Internal deterioration is most likely to occur in metal piping and storage facilities containing impure nonelectrolytic fluids.
1. True
 2. False
- 2-10. Rainwater is generally considered an electrolyte because it contains
1. dissolved atmospheric gases
 2. suspended solids
 3. minerals in solution
 4. measurable resistivity
- 2-11. Which of the following corrosive reactions is often the result of an agent, such as salt, being present in the environment?
1. Hydrogen embrittlement
 2. Localized galvanic action
 3. Stray current electrolysis
 4. Direct chemical attack
- 2-12. When you find it necessary to join copper and galvanized piping, the fitting should be equipped with which of the following materials?
1. An anode
 2. A fiber-glass wrap
 3. A dielectric bushing
 4. A standard cross-connection

- 2-13. Which of the following coatings is best suited for use as a corrosion inhibitor on exposed steel pipelines suspended along piers?
1. Coal tar
 2. Grease
 3. Concrete
 4. Asphalt
- 2-14. In the galvanic anode method of cathodic protection for steel structures, the structure is established as the cathode in a dissimilar metal galvanic cell by the use of what electrically connected component?
1. Copper anode
 2. Sacrificial anode
 3. Magnesium cathode
 4. Controlled resistor
- 2-15. The impressed current method of cathodic protection is different from the galvanic anode method in which of the following ways?
1. An electrical source is not required
 2. A direct current is applied from anode to cathode
 3. An anode is unnecessary
 4. A cathode may be used for the anode

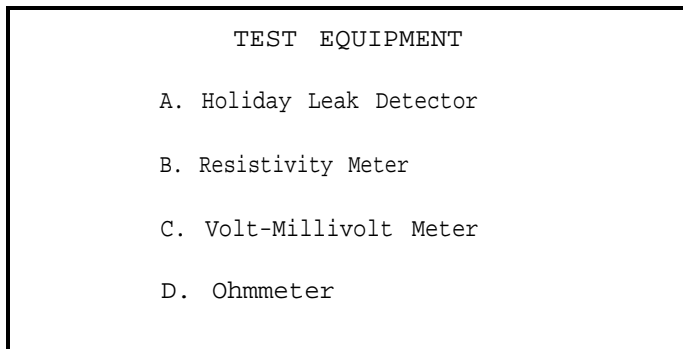


Figure 2A

IN ANSWERING QUESTIONS 2-16 THROUGH 2-20, REFER TO FIGURE 2A.

- 2-16. Locate imperfections in pipe coatings:

1. A
2. B
3. C
4. D

- 2-17. Measure the structure-to-soil potential of a given cathodic protection system:

1. D
2. C
3. B
4. A

- 2-18. Locate an area suitable for an anode bed:

1. A
2. B
3. C
4. D

- 2-19. Measure the corrosive susceptibility of a given soil:

1. D
2. C
3. B
4. A

- 2-20. Determine the variation in potential of galvanic anodes:

1. A
2. B
3. C
4. D

- 2-21. All automatic sprinkler systems have which of the following characteristics in common?

1. Water supply
2. Piping network
3. Sprinklers
4. Each of the above

- 2-22. What type of automatic sprinkler system is most commonly used?

1. Wet pipe
2. Semidry pipe
3. Low-differential dry pipe
4. Latched-clapper dry pipe

- 2-23. In a dry-pipe system, the pipes can contain air or what other element under pressure?

1. Argon
2. Nitrogen
3. Hydrogen
4. Xenon

- 2-24. In a differential dry-pipe valve system, the air must be maintained at least how many psi greater than the trip pressure?
1. 5
 2. 10
 3. 15
 4. 20
- 2-25. When debris in the water is a problem, you should use what type of dry-pipe valve?
1. Low differential
 2. High differential
 3. Mechanical
 4. Latched clapper
- 2-26. What type of automatic sprinkler system should you use in an aircraft hangar?
1. Wet pipe
 2. Semidry pipe
 3. Water-deluge
 4. Semiwet pipe
- 2-27. Preprime plugs blow out of the sprinklers at approximately what water pressure?
1. 10 psi
 2. 15 psi
 3. 20 psi
 4. 25 psi
- 2-28. Automatic sprinklers have orifices graduated in what size increments?
1. 1/16 inch
 2. 1/8 inch
 3. 1/4 inch
 4. 1/2 inch
- 2-29. A fusible-link sprinkler is kept closed by a two-piece link fused together by what type of metal?
1. Copper
 2. Aluminum
 3. Solder
 4. Steel
- 2-30. A dry-pendent sprinkler is used when the system is exposed to which of the following conditions?
1. High ambient temperatures
 2. Freezing temperatures
 3. Explosive elements
 4. Unstable chemicals
- 2-31. A dry-pipe alarm system has which of the following characteristics?
1. It is slow acting
 2. It is moderate acting only
 3. It is fast acting only
 4. It is moderate or fast acting
- 2-32. The retard switch connected to the alarm port of a wet sprinkler system alarm-check valve is normally set within what pressure range?
1. 10 to 20 psi
 2. 8 to 15 psi
 3. 6 to 15 psi
 4. 4 to 15 psi
- 2-33. A pressure pump/pressure drop type of water-flow detector is usually adjusted to maintain what system pressure above normal supply pressure?
1. 20 to 40 psi
 2. 25 to 50 psi
 3. 30 to 60 psi
 4. 35 to 70 psi
- 2-34. In an electronic pressure-drop detector, an overpressure condition of what magnitude can cause a trouble signal?
1. 100 psi
 2. 150 psi
 3. 200 psi
 4. 250 psi
- 2-35. To prevent freezing of water in a fire protection system, a Utilitiesman normally installs a supervisory device in a pipe or reservoir with what low water-temperature setting?
1. 0° F
 2. 25° F
 3. 32° F
 4. 40° F

INSPECTION AND TEST PERIODS

- A. Weekly
- B. Monthly
- C. Quarterly
- D. Annually
- E. Every 3 years

Figure 2B

IN ANSWERING QUESTIONS 2-36 THROUGH 2-43, REFER TO FIGURE 2B.

2-36. General condition of sprinkler heads and sprinkler systems:

- 1. B
- 2. C
- 3. D
- 4. E

2-37. Water-flow alarms:

- 1. A
- 2. B
- 3. C
- 4. D

2-38. Air and water pressure in dry-pipe systems:

- 1. D
- 2. C
- 3. B
- 4. A

2-39. High-speed suppression systems:

- 1. B
- 2. C
- 3. D
- 4. E

2-40. General condition of standpipe systems:

- 1. D
- 2. C
- 3. B
- 4. A

2-41. General condition of hydrants:

- 1. B
- 2. C
- 3. D
- 4. E

2-42. Water level in tanks:

- 1. A
- 2. B
- 3. C
- 4. D

2-43. Valves (to see if they are in the open position):

- 1. D
- 2. C
- 3. B
- 4. A

2-44. What minimum distance must be maintained beneath a sprinkler for proper water distribution?

- 1. 48 inches
- 2. 36 inches
- 3. 24 inches
- 4. 18 inches

2-45. What type of test should be performed quarterly to test the alarm-check valves?

- 1. 6-inch drain test
- 2. 2-inch drain test
- 3. 8-inch drain test
- 4. 4-inch drain test

2-46. In a dry-pipe sprinkler system, the entire system should be checked for tightness when air pressure losses exceed what value?

- 1. 5 psi
- 2. 10 psi
- 3. 15 psi
- 4. 20 psi

2-47. When testing a water-clapper valve designed to trip at a fixed pressure of 10 to 15 psi, you should maintain what minimum air pressure on this valve?

- 1. 15 psi
- 2. 30 psi
- 3. 45 psi
- 4. 60 psi

- 2-48. When performing a basic inspection of accelerators and exhausters, you should check what pressure?
1. Water
 2. Air
 3. Centrifugal
 4. Atmospheric
- 2-49. When testing a dry-pipe valve, you should perform what action first?
1. Close the main control valve
 2. Open the main control valve
 3. Open the inspector test connection
 4. Close the inspector test connection
- 2-50. Once the dry-pipe system has been tested and the dry-pipe valve reset, you should check the air pressure within what approximate time period?
1. 12 to 24 hours
 2. 2 to 4 hours
 3. 24 to 48 hours
 4. 4 to 8 hours
- 2-51. When testing deluge and preaction valves, you should perform the 2-inch drain test at what time interval?
1. Weekly
 2. Monthly
 3. Quarterly
 4. Annually
- 2-52. When performing a deluge valve dry trip-test in a flammable area, you should use what test in place of the electric test set?
1. Infrared light
 2. Hot water only
 3. Hot cloth only
 4. Hot water or hot cloth
- 2-53. When performing the cathodic protection test with an ammeter, you notice a diminishing current flow. This is an indication of what type of problem?
1. Failing electrodes
 2. Blown fuses
 3. Frozen electrodes
 4. Broken ground wires
- 2-54. Under normal circumstances, full operational testing of high-speed suppression systems should be conducted at intervals not to exceed how many years?
1. 1
 2. 5
 3. 3
 4. 7
- 2-55. Gaseous extinguishing systems are normally located in which of the following areas?
1. Computer operation centers
 2. Radio receiver buildings
 3. Power generating facilities
 4. Each of the above
- 2-56. A local application system would normally be found in which of the following locations?
1. Paint dip tank
 2. Restaurant range hood
 3. Special motor
 4. Each of the above
- 2-57. What type of system, if any, should you install in a transformer vault that contains oil-filled equipment?
1. Local application
 2. Total flooding
 3. Hose line
 4. None
- 2-58. What characteristic of carbon dioxide makes it desirable for use on electrical fires?
1. High-pressure application
 2. Electrical conductivity
 3. Electrical nonconductivity
 4. Low-pressure application
- 2-59. What is the normal cylinder pressure in a high-pressure system?
1. 600 psi
 2. 500 psi
 3. 400 psi
 4. 300 psi

- 2-60. Storage area ambient temperatures for carbon dioxide cylinders should be within what temperature range?
1. 0°F to 100°F
 2. 32°F to 130°F
 3. 40°F to 150°F
 4. 50° F to 100°F
- 2-61. In a low-pressure system, the frangible disk is designed to burst at what pressure?
1. 200 psi
 2. 400 psi
 3. 600 psi
 4. 800 psi
- 2-62. In a low-pressure system, liquid carbon dioxide should always be maintained at what constant (a) pressure and (b) temperature?
1. (a) 200 psi (b) 0°F
 2. (a) 300 psi (b) 32°F
 3. (a) 200 psi (b) 32°F
 4. (a) 300 psi (b) 0°F
- 2-63. High-pressure systems require approximately how many pounds of equipment for every pound of carbon dioxide stored?
1. 1
 2. 5
 3. 3
 4. 7
- 2-64. Pipe and fittings in a high-pressure system have what minimum bursting pressure?
1. 2,000 psi
 2. 3,000 psi
 3. 5,000 psi
 4. 7,000 psi
- 2-65. Pipe and fittings in a low-pressure system have a minimum bursting pressure of how many psi?
1. 1,800
 2. 2,000
 3. 2,800
 4. 3,000
- 2-66. Pressure-relief devices operate at what pressure on a low-pressure system?
1. 400 psi
 2. 450 psi
 3. 500 psi
 4. 550 psi
- 2-67. What automatic device should be installed along with a total flooding system to conserve carbon dioxide?
1. Closing
 2. Venting
 3. Door closure
 4. Electrical lockout

ASSIGNMENT 3

Textbook Assignment: "Fire protection systems" and "Water Treatment and Purification."
Pages 8-29 through 9-13.

3-1. You are maintaining a halon fire protection system. You should consult a person in what organization for a system conversion?

1. NFPA
2. EPA
3. OSHA
4. Engineering

3-2. Installation of a new halon 1301 system is prohibited without special approval from whom?

1. NAVFACENGCOM
2. EPA
3. ROICC
4. Base fire chief

3-3. The production of halons will be eliminated by the year 2000?

1. True
2. False

3-4. What length of time delay, in seconds, is built into a halon system actuator?

1. 10 to 30
2. 10 to 45
3. 15 to 60
4. 20 to 45

3-5. Regardless of the method being used, what device must be attached to the releasing mechanism?

1. An auxiliary fan
2. A control valve
3. A light
4. An alarm

INSPECTION AND TEST PERIODS

- A. Weekly
- B. Monthly
- C. Quarterly
- D. Semiannually
- E. Annually

Figure 3A

IN ANSWERING QUESTIONS 3-6 THROUGH 3-8,
REFER TO FIGURE 3A.

3-6. Halon and carbon dioxide nozzles.

1. A
2. C
3. D
4. E

3-7. Weighing cylinders.

1. A
2. B
3. C
4. D

3-8. Leakage of devices and connections in a low-pressure carbon dioxide system.

1. A
2. B
3. D
4. E

- 3-9. You should perform a hydrostatic test on cylinders and hoses at what maximum time interval, in years?
1. 5
 2. 7
 3. 8
 4. 12
- 3-10. At what maximum time interval should you replace the frangible disks on low-pressure storage tanks?
1. 5 years
 2. 7 years
 3. 8 years
 4. 12 years
- 3-11. What type of system can be used with dry chemicals?
1. Total flooding
 2. Local application
 3. Hose line
 4. Each of the above
- 3-12. What is the most widely used dry chemical?
1. Nitrogen
 2. Sodium bicarbonate
 3. Monoammonium phosphate
 4. Potassium phosphate
- 3-13. Dry chemicals are used primarily on what type of fires?
1. Flammable liquid
 2. Cellulose nitrate
 3. Dry wood
 4. Delicate electrical equipment
- 3-14. The term "saponification" refers to what reaction between a dry chemical and a fire source?
1. Chemical neutralization
 2. Conversion of fatty grease to soap
 3. Electronic equipment reaction
 4. Heavy metal reaction
- 3-15. What type of gas is used as a propellant for a dry chemical system?
1. Hydrogen
 2. Oxygen
 3. Nitrogen
 4. Carbon dioxide
- 3-16. Dry chemical distribution systems should be constructed of what schedule of steel pipe?
1. 10
 2. 20
 3. 30
 4. 40
- 3-17. What term, if any, is used to describe the special problem of inertia that must overcome in nozzle installation?
1. Pressure drop
 2. Saponification
 3. Balancing
 4. None
- 3-18. What term is used to describe a water source developed for military use?
1. Water source
 2. Water point
 3. Water well
 4. Water outlet
- 3-19. A total of how many gallons per minute are flowing in a stream that is 10 feet wide and has an average depth of 3 feet when the water is flowing at a velocity of 15 feet per minute?
1. 960
 2. 1,920
 3. 2,880
 4. 3,350
- 3-20. Compute the quantity of water in a lake that is 100 feet long, 20 feet wide, has an average depth of 6 feet, and no run off?
1. 30,000 gallons
 2. 60,000 gallons
 3. 90,000 gallons
 4. 120,000 gallons

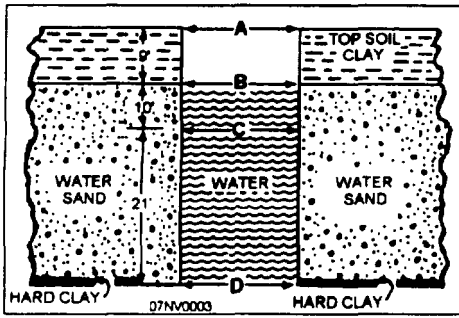


Figure 3B

IN ANSWERING QUESTIONS 3-21 THROUGH 3-23, REFER TO FIGURE 3B AND ASSUME THAT THE WATER STABILIZES AT POINT C AFTER CONTINUOUS PUMPING AT A CONSTANT RATE OF 50 GALLONS PER MINUTE.

3-21. The static level of the well is located at what point?

1. A
2. B
3. C
4. D

3-22. As measured from the ground surface, what is the dynamic water level of the well, in feet?

1. 9
2. 10
3. 19
4. 21

3-23. The amount of drawdown is equal to the distance between what points?

1. A and B
2. A and C
3. B and C
4. B and D

3-24. The yield of the well for a particular drawdown depends on which of the following factors?

1. Permeability of the topsoil and clay
2. Permeability of the water-bearing formation
3. Width or diameter and depth of the well
4. Depth from the surface to the static water level

3-25. Which of the following types of sand provides the greatest rate of flow during drawdown?

1. Fine sand with grains irregular in size
2. Fine sand with grains nearly uniform in size
3. Coarse sand with grains irregular in size
4. Coarse sand with grains nearly uniform in size

3-26. When determining the hydraulic characteristics of a well, you should not consider which of the following data?

1. Volume of water pumped per unit of time
2. Percolation rate per unit of time
3. Static water level before pumping
4. Pumping level at a constant pumping rate

3-27. The pump and power unit used for testing a well should be capable of continuous operation for a minimum of how many hours?

1. 24
2. 48
3. 72
4. 96

3-28. What should be the maximum operating rate of a pump for testing the yield of a well?

1. One that causes 50 percent of maximum possible drawdown
2. One that causes the maximum possible drawdown
3. Approximately 50 gpm
4. Approximately 100 gpm

3-29. The term "safe pumping yield" is defined as having what withdrawal rate?

1. A total of 50 percent of maximum drawdown without lowering the water table
2. A total of 75 percent of maximum drawdown without lowering the water table
3. An amount that allows for total recovery in 30 minutes or less
4. An amount that allows for total recovery in 1 hour or less

3-30. Relative to the initial development of a well, a complete test report includes the initial static water level, pumping rates, drawdown data, rate of recovery, and what other information?

1. Pump chart
2. Well chart
3. Bacteriological report
4. Water analysis report

3-31. In a temperate zone, what is the daily water consumption, in gallons, for one person marching in formation?

1. 1
2. 2
3. 1/2
4. 1 1/2

IN ANSWERING QUESTIONS 3-32 THROUGH 3-33, CONSIDER A GROUP OF 40 MEN IN A TEMPERATE ZONE WHERE THE TERRAIN IS LEVEL. YOU ARE EQUIPPED WITH FOUR LARGE TRUCKS AND TWO JEEPS.

3-32. When field rations are being used under combat conditions, what daily minimum individual water requirement should you consider appropriate?

1. 22 gallons
2. 42 gallons
3. 82 gallons
4. 102 gallons

3-33. Under peaceful conditions, you have set up a temporary camp with bathing facilities. What is the total daily water requirement?

1. 200 gallons
2. 401 gallons
3. 602 gallons
4. 1,200 gallons

3-34. What are the two classification of water impurities?

1. Suspended or bacteria
2. Suspended or dissolved
3. Dissolved or silt
4. Dissolved or bacteria

IN ANSWERING QUESTIONS 3-35 THROUGH 3-41, SELECT FROM COLUMN B THE EFFECT OF EACH WATER IMPURITY IN COLUMN A. RESPONSES MAY BE USED MORE THAN ONCE.

A. IMPURITIES

B. EFFECTS

3-35. Manganese

1. Alkalinity

3-36. Magnesium carbonate

2. Odor

3-37. Calcium bicarbonate

3. Brown water

3-38. Carbon dioxide

4. Corrosion of metal

3-39. Algae

3-40. Calcium chloride

3-41. Dissolved oxygen

3-42. What data, if any, should you study to determine the variation in reliability that may be expected at a water source?

1. Geological
2. Hydrological
3. Bacteriological
4. None

3-43. At what level of government is the title to ground and surface water normally regulated within the United States?

1. Township
2. County
3. State
4. Federal

3-44. A temporary water source should not be converted into a permanent water source until after what activity has taken place?

1. A title search for water rights
2. An area search for a source requiring less development
3. An impurities examination by the medical officer
4. An inspection by the public works officer for additional free-flowing springs

3-45. The strainer on a suction hose should be placed a total of how many inches under the water level?

1. 6
2. 8
3. 3
4. 4

- 3-46. For a normal field water supply, what type of water source is the most accessible?
1. Well
 2. Spring
 3. Subsurface
 4. Surface
- 3-47. In a swiftly flowing stream, what type of dam can be constructed to protect an intake screen without impounding the water?
1. Wing only
 2. Baffle only
 3. Wing or baffle
 4. Ripple or wing
- 3-48. The quality of water from a muddy stream can be improved in which of the following ways?
1. By sinking shallow wells
 2. By digging intake galleries
 3. By filling unneeded trenches
 4. By digging outtake galleries
- 3-49. Moisture is held beneath the surface of the earth in what total number of zones?
1. One
 2. Two
 3. Three
 4. Four
- 3-50. Groundwater is the term used to describe underground water in what zone?
1. Filtration
 2. Aeration
 3. Saturation
 4. Soil moisture
- 3-51. In a driven well, the sections of well pipe are delivered in lengths of what size?
1. 5 feet
 2. 10 feet
 3. 15 feet
 4. 20 feet
- 3-52. When developed properly, springs yielding a minimum of how many gallons per minute can be used as a source of field water?
1. 5
 2. 10
 3. 15
 4. 20
- 3-53. Refer to figure 9-6. What condition exists that requires the intake screen to be surrounded by coarse gravel?
1. The inlet hose is on a steep slope
 2. The turbidity of the water is very high
 3. The water source does not cover the screen by at least 4 inches
 4. The water contains a large amount of suspended solids
- 3-54. Little or no consideration is given to the development of a thermal spring as a water source for which, if any, of the following reasons?
1. The high cost involved
 2. The unreliability of such a spring
 3. The likelihood of heavy mineral concentrations
 4. None of the above
- 3-55. In the development of a spring, an impervious type of permanent structure should be used to protect the water source against
1. water from building drains only
 2. surface water drainage only
 3. rainwater only
 4. water from all sources other than the spring
- 3-56. There is a total of how many classifications of wells?
1. Five
 2. Seven
 3. Three
 4. Nine
- 3-57. A well that is dug is usually 3 feet in diameter or more and within what depth range?
1. 10 feet to 30 feet
 2. 15 feet to 40 feet
 3. 20 feet to 40 feet
 4. 25 feet to 50 feet
- 3-58. A well can normally be bored within what maximum depth without fear of a cave-in?
1. 30 feet
 2. 40 feet
 3. 50 feet
 4. 60 feet

3-59. When jetting a well, you turn the jet or frill slowly for what purpose?

1. To ensure the hole is straight
2. To assist in sinking the casing
3. To remove mud and sand
4. To extract muddy water

3-60. When a well is driven, the drive points are within what size range?

1. 1 inch to 3 inches
2. 2 1/4 inches to 3 inches
3. 3 inches to 4 inches
4. 1 1/4 inches to 2 inches

3-61. When a 2-inch well casing is used with a small self-priming centrifugal pump, water can be lifted from what maximum depth?

1. 24 feet
2. 48 feet
3. 72 feet
4. 96 feet

3-62. What is the purpose of a jar test?

1. To aid in the removal of turbidity
2. To indicate what chemical is necessary for coagulation
3. To determine whether the water is turbid
4. To provide sedimentation of the contents in the jar

3-63. To guard against subsurface contamination, you should locate rainwater catchment areas at what minimum distance from possible sources of contamination?

1. 25 feet
2. 50 feet
3. 75 feet
4. 100 feet

3-64. What minimum treatment is required for collected rainwater that is to be used as a water source?

1. Filtration only
2. Disinfection only
3. Filtration and disinfection
4. Aeration and filtration

3-65. A total of how many cubic feet of snow is required to produce 1 cubic foot of water?

1. 5
2. 7
3. 3
4. 9

ASSIGNMENT 4

Textbook Assignment: "Water Treatment and Purification" and "Sewage Treatment and Disposal." Pages 9-14 through 10-29.

- 4-1. Physical impurities in water are divided into what two classifications?
1. Color and turbidity
 2. Suspended and dissolved
 3. Mineral and bacteria
 4. Silt and odor
- 4-2. Which of the following chemicals can be used to prevent the formation of algae in raw water supply points?
1. Chlorine
 2. Copper sulfate
 3. Activated carbon
 4. Each of the above
- 4-3. What term accurately describes a muddy or unclear condition of water caused by sand, clay, or organic matter?
1. Suspension
 2. Turbidity
 3. Backwashing
 4. Coagulation
- 4-4. To treat 1,000 gallons of water, you should use approximately how many ounces of activated carbon?
1. 1
 2. 10
 3. 100
 4. 1,000
- 4-5. When you are using copper sulfate to treat a lake, concentrations of organisms should never exceed how many parts per million to protect the lives of fish?
1. 1
 2. 2
 3. 3
 4. 5
- 4-6. You should reduce the water treatment rate when the outside temperature reaches what level?
1. 0°F
 2. 20°F
 3. 32°F
 4. 45°F
- 4-7. The total concentration of manganese in potable water should not exceed how many parts per million?
1. 0.1
 2. 0.3
 3. 0.5
 4. 0.7
- 4-8. The ion exchange unit removes which of the following undesirable properties of water?
1. Asbestos and chemicals
 2. Chemicals and radioactive particles
 3. Manganese and lead
 4. Hexavalent chromium and fluoride
- 4-9. Dissolved gases can be removed from a water supply by what means?
1. Aeration
 2. Chlorination
 3. Coagulation
 4. Ion exchange
- 4-10. You should NOT treat water with activated carbon that exceeds what maximum dosage?
1. 10 ppm
 2. 15 ppm
 3. 20 ppm
 4. 25 ppm
- 4-11. A water source with a pH value less than what number is an indication of possible CBR contamination?
1. 1.5
 2. 3.5
 3. 5.0
 4. 6.0

4-12. What water test kit does medical use to check a water source for chemical contamination?

1. M678
2. M474
3. M272
4. M222

4-13. The nuclear post-treatment cylinder used with the ROWPU removes which of the following agents?

1. Strontium
2. VX
3. BZ
4. All of the above

4-14. The rate of product water from the ROWPU is directly affected by the

1. turbidity of the water source
2. amount of contamination in the water source
3. operating pressure
4. temperature of the water source

4-15. What is the name of the process whereby latent heat is removed and steam becomes water?

1. Evaporation
2. Distillation
3. Vaporization
4. Condensation

4-16. The compressor in a thermal compression distillation unit raises the temperature of the steam from 212°F to what temperature?

1. 220°F
2. 222°F
3. 226°F
4. 229°F

4-17. Water produced by distillation equipment should NOT be used for what purpose?

1. Fire protection
2. Vehicle washing
3. Galley scrubbing
4. Personal cleanliness

4-18. To date, what type of filter is the most effective ever devised ?

1. Silica
2. Diatomite
3. Algae
4. Sand

4-19. You should use a slow sand filter under which of the following circumstances?

1. Coagulation is part of the process
2. High water output is desired
3. Low cost of operation is essential
4. Coagulation is not included in the process

4-20. The diatomite filter is classified as what type of filter?

1. Slow sand
2. Rapid sand
3. Pressure drop
4. Pressure

4-21. What type of treatment is used in residual disinfection as the final step in the water treatment process?

1. Coagulation
2. Chlorination
3. Activated carbon
4. Soda ash

4-22. What two extreme values retard disinfection?

1. High pH and low temperature
2. Low pH and high temperature
3. High pH and high temperature
4. Low pH and low temperature

4-23. What minimum amount of residual chlorine is considered significant?

1. 0.1 ppm
2. 0.2 ppm
3. 0.3 ppm
4. 0.4 ppm

4-24. What standard period of contact time is required for disinfection purposes to kill disease-producing organisms?

1. 10 minutes
2. 20 minutes
3. 30 minutes
4. 40 minutes

- 4-25. After using water sterilizing bags, you should add enough chlorine to the water so the residual chlorine after a total of 30 minutes has what minimum value?
1. 5 ppm
 2. 7 ppm
 3. 3 ppm
 4. 9 ppm
- 4-26. What is the minimum amount of time you must boil water to kill disease-producing bacteria?
1. 60 seconds
 2. 45 seconds
 3. 30 seconds
 4. 15 seconds
- 4-27. What term describes the process whereby more chlorine than needed for the chlorine residual essential to marginal chlorination is used?
1. Chlorination
 2. Superchlorination
 3. Dechlorination
 4. Dissipation
- 4-28. When decay proceeds under anaerobic conditions, what is the ultimate result?
1. Offensive odors
 2. Unsightly appearances
 3. Offensive conditions
 4. Each of the above
- 4-29. On a Navy installation that discharges liquid waste into controlled waters, you must maintain what standards?
1. Federal standards
 2. State standards only
 3. Local standards only
 4. State and local standards
- 4-30. Which of the following types of industrial waste should NOT be dumped into a regular sewage collection system?
1. Dry-cleaning fluids
 2. Radioactive isotopes
 3. Metal plating residues
 4. Flammable liquids
- 4-31. A heavy input of storm water into a sewage treatment plant results in what type of hydraulic problems?
1. Underloading
 2. Bypassing
 3. Overloading
 4. Diverting
- 4-32. Within a 24-hour period, the lowest flow in a sewage treatment system is between what hours?
1. 0000-0500 hours
 2. 0500-1000 hours
 3. 1000-1500 hours
 4. 1500-2000 hours
- 4-33. What is the normal color of wastewater containing dissolved oxygen?
1. Black
 2. Brown
 3. Gray
 4. Green
- 4-34. Domestic sewage should have what noticeable odor?
1. Moldy
 2. Sulphurous
 3. Grainy
 4. Musty
- 4-35. Wastewater is normally composed of what percentage of (a) water and (b) solids?
1. (a) 99.9 (b) 1.1
 2. (a) 99.9 (b) 0.1
 3. (a) 95.9 (b) 1.1
 4. (a) 95.9 (b) 0.1
- 4-36. What term is used to describe suspended solids that are not dissolved in wastewater?
1. Floatable solids
 2. Sludge
 3. Colloidal particles
 4. Sedimentation
- 4-37. Volatile solids either burn or evaporate within what temperature range?
1. 1500°C to 1600°C
 2. 1200°C to 1300°C
 3. 700°C to 800°C
 4. 500°C to 600°C

- 4-38. The acid or base properties of a water solution is measured in
1. mg/l
 2. ml/l
 3. pH
 4. DO
- 4-39. What term is used to describe wastewater that contains dissolved oxygen?
1. Anaerobic
 2. Aerobic
 3. Raw sewage
 4. Treated sewage
- 4-40. What term accurately describes the amount of oxygen used by bacteria and other wastewater organisms as they feed upon the organic solids in wastewater?
1. Oxygen nutrients
 2. Oxygen demand
 3. Oxygen supply
 4. Dissolved oxygen
- 4-41. What are the three biological organisms present in wastewater?
1. Bacteria, viruses, and pathogens
 2. Viruses, parasites, and pathogens
 3. Bacteria, parasites, and pathogens
 4. Viruses, bacteria, and parasites
- 4-42. What type of bacteria requires dissolved oxygen to remain alive?
1. Facultative
 2. Anaerobic
 3. Aerobic
 4. Parasitic
- 4-43. A grab sample normally covers what time span?
1. 15 minutes
 2. 30 minutes
 3. 45 minutes
 4. 60 minutes
- 4-44. A composite sample normally covers what time span?
1. 16 hours
 2. 2 hours
 3. 8 hours
 4. 4 hours
- 4-45. The flow proportional composite sample normally covers what time span?
1. 12 hours
 2. 24 hours
 3. 36 hours
 4. 48 hours
- 4-46. Which of the following tests should be performed at the time of sample selection?
1. Dissolved oxygen
 2. Sample temperature
 3. pH
 4. All of the above
- 4-47. For proper storage, you should maintain the sample within what temperature range?
1. -2°C to -10°C
 2. 2°C to 10°C
 3. 10°C to 18°C
 4. 18°C to 26°C
- 4-48. At sea level, pure water at 20°C can hold a maximum of how many milligrams per liter of dissolved oxygen?
1. 0.917
 2. 9.17
 3. 91.7
 4. 917.0
- 4-49. Treatment plant influent water should be between what pH values?
1. 6.5 to 8
 2. 2 to 4
 3. 8.5 to 10
 4. 4 to 6
- 4-50. An Imhoff cone should be used to perform which of the following tests?
1. Dissolved oxygen
 2. Activated sludge
 3. Settleable solids
 4. Hydrogen ion concentration
- 4-51. When performing the BOD₅ test, you should read one sample immediately and store the other at 20°C for exactly how many days?
1. 5
 2. 2
 3. 3
 4. 7

- 4-52. In which of the following tests should the sample be allowed to sit for 30 minutes?
1. Dissolved oxygen
 2. Activated sludge
 3. Settleable solids
 4. Hydrogen ion concentration
- 4-53. A COD test can be performed in a minimum of how many hours?
1. 1
 2. 2
 3. 3
 4. 4
- 4-54. Which of the following tests should be used as a control test to help you decide whether to increase or decrease the rate of sludge return?
1. pH
 2. MLSS
 3. BOD₅
 4. COD
- 4-55. Which of the following tests should be performed within 30 minutes of taking a sample?
1. Total suspended solids
 2. Mixed liquor suspended solids
 3. Chlorine residual
 4. Fecal coliform
- 4-56. After a sample is chilled to 4°C, a fecal coliform test should be performed within how many hours?
1. 6
 2. 9
 3. 3
 4. 12
- 4-57. Laboratory records can be used for which of the following reasons?
1. To locate suitable plant operating controls
 2. To point out future plant requirements
 3. To protect the government from lawsuits
 4. Each of the above
- 4-58. Preventive maintenance should be scheduled so it can be performed at which of the following times?
1. During good weather only
 2. During peak loads only
 3. During good weather and low loads
 4. During bad weather and peak loads
- 4-59. For a wastewater plant that discharges effluent to a body of water, what type of permit must be obtained from the EPA or designated state agency?
1. NPDES
 2. Operating
 3. Discharge
 4. COD
- 4-60. What is the cheapest operating effluent discharge method?
1. Intermittent
 2. Continuous
 3. Direct discharge
 4. Indirect discharge
- 4-61. What type of effluent discharge requires a place to store the effluent?
1. Intermittent
 2. Continuous
 3. Direct discharge
 4. Indirect discharge
- 4-62. When effluent containing a toxic substance is accidentally discharged into receiving water used downstream as a drinking water supply for recreation or for livestock watering, the operator is required to notify which of the following constituents?
1. The regulating agency only
 2. The water users downstream only
 3. The regulating agency and the water users downstream
 4. The plant manager and the regulating agency
- 4-63. Recycled wastewater is seldom used for what type of water supply?
1. Industrial
 2. Recreational
 3. Irrigation
 4. Drinking

- 4-64. What type of soil has the best filtration and filtration characteristics?
1. Average loams only
 2. Sandy loams only
 3. Average and sandy loams
 4. Clay and top soil
- 4-65. When the weather is sunny, hot, and dry with strong breezes, what percentage of applied water can evaporate during the process of irrigation?
1. 15%
 2. 25%
 3. 50%
 4. 75%
- 4-66. Before being used on parks, golf courses, and other recreational areas, wastewater must be treated in which of the following ways?
1. Aerated
 2. Disinfected
 3. Clarified
 4. Polished
- 4-67. Vegetation around evaporation and percolation basins should not be allowed to exceed what maximum height?
1. 10 inches
 2. 15 inches
 3. 20 inches
 4. 24 inches
- 4-68. Trees should not be allowed to grow within how many feet of wastewater lagoons?
1. 150 feet
 2. 200 feet
 3. 450 feet
 4. 500 feet

ASSIGNMENT 5

Textbook Assignment: "Sewage Treatment and Disposal," "Compressed Air Systems," and "Boilers."
Pages 10-32 through 12-14.

- 5-1. What type of wastewater system eliminates the need for septic tanks, cesspools, or leaching fields?
1. Holding ponds
 2. Polishing ponds
 3. Common sewers
 4. Storm sewers
- 5-2. What is the minimum desirable size of a septic tank?
1. 500 gallons
 2. 1,000 gallons
 3. 1,250 gallons
 4. 2,000 gallons
- 5-3. When a septic tank discharges into a leaching field greater than 500 feet in length, you should incorporate what component(s) into the system ?
1. Dosing tank only
 2. Siphon only
 3. Dosing tank and siphon
 4. Inlet and outlet filters
- 5-4. Regardless of size, a septic tank should be inspected at what standard intervals?
1. 6 months
 2. 2 months
 3. 12 months
 4. 18 months
- 5-5. At what minimum distance from a septic tank should a (a) shallow well and (b) deep well be located?
1. (a) 200 feet (b) 50 feet
 2. (a) 200 feet (b) 75 feet
 3. (a) 100 feet (b) 50 feet
 4. (a) 100 feet (b) 75 feet
- 5-6. Leaching cesspools should be located what minimum distance from each other?
1. 10 feet
 2. 20 feet
 3. 30 feet
 4. 40 feet
- 5-7. Perforated pipe of what size should be used in leaching fields?
1. 10-inch diameter
 2. 8-inch diameter
 3. 6-inch diameter
 4. 4-inch diameter
- 5-8. What is the maximum allowable length of a leaching field lateral?
1. 50 feet
 2. 75 feet
 3. 100 feet
 4. 125 feet
- 5-9. When a leaching field becomes inoperable, you must consider what option?
1. Chemical cleaning
 2. System replacement
 3. Adding additional piping
 4. Pumping the septic tank
- 5-10. Low-pressure systems provide compressed air at a maximum of how many pounds per square inch gauge (psig)?
1. 25
 2. 75
 3. 100
 4. 125
- 5-11. Medium-pressure systems provide compressed air from 126 psig to what maximum pressure?
1. 299 psig
 2. 325 psig
 3. 399 psig
 4. 425 psig

- 5-12. High-pressure systems provide compressed air within what pressure range?
1. 400 psig to 4,000 psig
 2. 400 psig to 6,000 psig
 3. 425 psig to 4,000 psig
 4. 425 psig to 6,000 psig
- 5-13. What type of shop or laboratory requires up to 6,000 psig of compressed air?
1. Torpedo workshop
 2. Testing laboratory
 3. Wind tunnel
 4. Ammunition depot
- 5-14. Air compressor filter systems should be able to remove particles in what micron size range?
1. 1 to 3
 2. 2 to 5
 3. 3 to 7
 4. 4 to 9
- 5-15. Of the following grades of commercial compressed air, which one is the most pure?
1. B
 2. D
 3. F
 4. H
- 5-16. A refrigerant dryer with a dew point at what maximum temperature should be used to remove moisture to meet air quality requirements for instrument and control air?
1. 20°F
 2. 30°F
 3. 35°F
 4. 40°F
- 5-17. With pressure in excess of 400 psig, oil causes what compression phenomenon to occur?
1. Burnout
 2. Blowout
 3. Combustion
 4. Recycling
- 5-18. In a reciprocating compressor, what are the three compression cycle phases?
1. Intake, multistage pressurization, discharge
 2. Intake, impeller rotation, compression
 3. Intake, single-stage pressurization, discharge
 4. Intake, compression, discharge
- 5-19. In a W-type compressor, there are a total of how many cylinders in the (a) first and (b) second stages?
1. (a) One (b) one
 2. (a) Two (b) two
 3. (a) Two (b) one
 4. (a) One (b) two
- 5-20. What type of compressor has two mating rotating screws, one locked and one grooved, to provide the driving force?
1. Rotary
 2. Reciprocating
 3. Helical
 4. Centrifugal
- 5-21. When the load is reasonably constant, what type of compressor is intended for near-continuous industrial air service?
1. Rotary
 2. Reciprocating
 3. Helical
 4. Centrifugal
- 5-22. When placed through a parapet roof, you should extend air intakes what approximate distance above the roof?
1. 6 to 8 feet
 2. 8 to 10 feet
 3. 10 to 12 feet
 4. 12 to 14 feet
- 5-23. Of the following types of intake filters, which one(s) is/are best suited for use in locations where dust is prevalent in the atmosphere?
1. Oil bath only
 2. Viscous impingement only
 3. Oil bath and viscous impingement
 4. Oil injected and centrifugal lubricated

- 5-24. The intercooler in a multistage compressor serves what purpose?
1. To lower the temperature of discharged air
 2. To remove condensation and impurities from the air flow
 3. To reduce the temperature of compressed air between each stage
 4. To add cool air at the beginning of each cycle
- 5-25. Aftercoolers are used in compressor discharge lines for which of the following reasons?
1. To permit the use of larger discharge pipes
 2. To lower the air discharge temperature only
 3. To facilitate condensation and removal of moisture only
 4. To lower the air discharge temperature and facilitate condensation and removal of moisture
- 5-26. Separators are used in conjunction with aftercoolers for what purpose?
1. To remove water and oil from the compressed air
 2. To reduce working pressure in the distribution lines
 3. To separate noncondensable gases from the compressed air
 4. Each of the above
- 5-27. Compressor cylinder oil should have what minimum flash-point temperature?
1. 325°F
 2. 350°F
 3. 375°F
 4. 400°F
- 5-28. Pulsation dampeners serve as pulsation and noise mufflers due to what feature within the dampener?
1. An injector
 2. A vibration amplifier
 3. An acoustical chamber
 4. A sound resonator

- 5-29. The inlet valve unloading device functions mechanically to remove compression loads from the prime mover by
1. disengaging the drive clutch
 2. holding the inlet valve open during the suction and compression strokes
 3. opening the cylinder relief valve
 4. holding the inlet valve closed during the compression stroke

IN ANSWERING QUESTIONS 5-30 AND 5-31, REFER TO FIGURE 11-22.

- 5-30. When the receiver pressure has dropped from 100 psi to 94 psi, U(2) causes the compressor to operate at what percentage of its total output capacity?
1. 25%
 2. 50%
 3. 75%
 4. 100%
- 5-31. When the compressor is operating at 25 percent of capacity, the inlet unloader valves should be in what position?
1. U(4) energized; U(1), U(2), and U(3) de-energized
 2. Each unloader valve energized
 3. U(4) de-energized; U(1), U(2), and U(3) energized
 4. Each unloader valve de-energized
- 5-32. The volume of air that can be released from a compressor cylinder into one clearance pocket is equal to what percentage of the cylinder volume?
1. 25%
 2. 50%
 3. 75%
 4. 100%
- 5-33. When sizing a prime mover, you should take which of the following factors into consideration?
1. Availability of a dc power source
 2. Availability of unleaded fuel
 3. Compressor size in rpm
 4. Belt or drive losses of power

- 5-34. Belt selection for a large motor should be based on what ideal percentage of motor size?
1. 100%
 2. 125%
 3. 150%
 4. 175%
- 5-35. What type of air distribution system is used for isolated service or in situations where special requirements dictate a single path?
1. Parallel
 2. Loop
 3. Radial, one way
 4. Radial, two way
- 5-36. What type of closed-route air distribution system can be used throughout a building?
1. Parallel
 2. Loop
 3. Radial, one way
 4. Radial, two way
- 5-37. Normally, a compressed air distribution system is sized by calculating what factor?
1. Friction loss
 2. Pipe size
 3. Compressor size
 4. Oil loss
- 5-38. In situations where compressed air pipes are pitched upward causing condensate to flow against the flow of air, the minimum pitch of how many inches per hundred feet should be allowed?
1. 10
 2. 2
 3. 6
 4. 4
- 5-39. When testing the system with dry air or nitrogen, you should use what percentage of maximum working pressure for a minimum of 4 hours?
1. 75%
 2. 100%
 3. 125%
 4. 150%
- 5-40. What maintenance program prevents most major prime-mover breakdowns?
1. Manufacturer
 2. Operator
 3. Equipmentman
 4. Construction Mechanic
- 5-41. When a manufacturer's recommended tolerance level between two moving parts is exceeded on a compressor, you must perform which, if any, of the following actions?
1. A component adjustment only
 2. An equipment overhaul only
 3. A component adjustment or an equipment overhaul
 4. None of the above
- 5-42. Air filters should be checked and cleaned a minimum of how often?
1. Daily
 2. Weekly
 3. Monthly
 4. Quarterly
- 5-43. For assistance in air system maintenance and inspection, you should refer to what NAVFAC publication?
1. P-320
 2. P-322
 3. P-324
 4. P-330
- 5-44. When done properly, what is the most important single point in the successful operation of a boiler?
1. Installation
 2. Selection of the site
 3. Accessory procurement
 4. Quality of replacement parts
- 5-45. A boiler should normally be installed in which of the following locations?
1. Close to the galley
 2. Close to the laundry
 3. Near the area of greatest load demand
 4. Near the area of least load demand

5-46. When constructing a boiler foundation you must adhere to what specifications?

1. ASME
2. NAVFAC
3. Manufacturer
4. Organizational

5-47. The main steam stop valve must be a rising spindle type, if the valve is over what size?

1. 1 inch
2. 2 inches
3. 3 inches
4. 4 inches

5-48. What type of valve is located between the main steam stop valve and the guard valve?

1. Relief
2. Daylight
3. Pressure regulating
4. Temperature regulating

IN ANSWERING QUESTIONS 5-49 AND 5-50, REFER TO FIGURE 12-1.

5-49. What accessory is depicted by number 10?

1. Drip leg
2. Root valve
3. PRV
4. TRV

5-50. What accessory is located near number 15?

1. Feed pump
2. Condensate tank
3. Strainer
4. Relief valve

5-51. Refer to foldout figure 12-2. What fitting is depicted by number 8?

1. Gauge glass
2. Glass blowdown
3. Pressure gauge
4. Try cock

5-52. Boilers having a heating surface in excess of 100 square feet must be provided with blowdown piping and fittings in what size range?

1. 1 inch to 2 1/2 inches
2. 1 1/4 inches to 2 1/4 inches
3. 1 1/2 inches to 2 1/2 inches
4. 1 3/4 inches to 2 3/4 inches

5-53. You should manually lift each safety valve to clean it at what intervals?

1. Weekly
2. Biweekly
3. Monthly
4. Quarterly

5-54. Steam piping that is buried or inaccessible requires a drip leg at intervals of not over how many feet?

1. 400
2. 300
3. 200
4. 100

5-55. Normally, a root valve is what type of valve?

1. Butterfly
2. Altitude
3. Globe
4. Gate

5-56. The pressure gauge on a boiler should be tested at what intervals?

1. Annually
2. Semiannually
3. Quarterly
4. Monthly

5-57. As a minimum, high-pressure, HTW, and MUSE boilers require a hydrostatic test at what intervals, in years?

1. 1
2. 2
3. 3
4. 4

- 5-58. When chemically treating a boiler, you should maintain what recommended residual for phosphate?
1. 20 to 40 ppm
 2. 25 to 50 ppm
 3. 30 to 60 ppm
 4. 35 to 70 ppm
- 5-59. Assume the original wall thickness of a tube is 0.225 inch and an exploring block has been cut and examined. What wall thickness requires complete renewal of all tubes from front to rear of the boiler and from center row to outer row, inclusive?
1. 0.110 inch
 2. 0.115 inch
 3. 0.120 inch
 4. 0.125 inch
- 5-60. Under what conditions can a boiler be steamed with tubes that are pitted to a depth of 50 to 65 percent of their wall thickness?
1. When the boiler has been chemically cleaned
 2. When the boiler can withstand a hydrostatic test of 125 percent of design pressure
 3. When future boiler water treatment, use of blowdown, and laying-up procedures conform to NAVFAC requirements
 4. Each of the above
- 5-61. What type of tube defect has scattered pits caused by dissolved oxygen that are relatively short and narrow?
1. Waterside cavities
 2. Waterside grooves
 3. Localized pitting
 4. Corrosion fatigue
- 5-62. At what temperature can waterside burning occur in plain carbon steel tubes?
1. 650°F
 2. 750°F
 3. 900°F
 4. 1000°F
- 5-63. When defects are discovered during waterside inspection of drums and headers or other pressure parts of the boiler, you should take what action?
1. Report the defects to the maintenance officer
 2. Record the defects in the maintenance log
 3. Record the defects in the boiler water treatment log
 4. Each of the above
- 5-64. A hydrostatic test of 125 percent of boiler design pressure is acquired at which of the following times?
1. After renewing downcomers
 2. After rolling superheater support tubes
 3. After renewal of pressure parts
 4. After cleaning firesides
- 5-65. Before cleaning a boiler with an operating pressure of 600 psi, you should hydrostatically test it at what pressure?
1. 150 psi
 2. 600 psi
 3. 750 psi
 4. 900 psi
- 5-66. A hydrostatic test at 150 percent of design pressure is basically what type of test?
1. Tightness of gaskets
 2. Strength of boiler
 3. Tightness of valve seats
 4. Each of the above
- 5-67. After repairs are made to a boiler and before applying a hydrostatic test, you should perform each of the following actions with what exception?
1. Gauging boiler safety valves
 2. Flushing out the boiler with water
 3. Closing all boiler connections and vents
 4. Inspecting the boiler for scale and dirt

5-68. When hydrostatically testing a boiler, you can avoid complications due to temperature changes by

1. continuously operating the main feed pump
2. using water of the same temperature as the boiler and the fireroom
3. using water with temperature below 70°F
4. using hot water from the deaerating feed tank

5-69. A tube seat can be considered tight under which of the following circumstances?

1. It has been rerolled
2. It is bone dry
3. It has been renewed
4. It is only slightly cracked

5-70. The purpose of a 5-year test and inspection is to check what boiler elements?

1. Welds and nozzle connections
2. Handhole and manhole seats
3. Safety valves and welded parts
4. Internal fittings and air vents

ASSIGNMENT 6

Textbook Assignment: "Boilers." Pages 12-14 through 12-37.

- 6-1. Boiler firesides are inspected for signs of damage and deterioration when the boiler is secured for fireside cleaning. At what other intervals should this type of inspection be performed?
1. Each day the boiler is secured
 2. Each time the boiler is secured
 3. When material inspection is inevitable
 4. When NAVFAC requests an inspection
- 6-2. Slag is injurious to refractories chiefly because it results in which of the following problems?
1. Cracking of the refractories
 2. Filling of expansion joints
 3. Peeling off a portion of the refractory surface
 4. Powdering of the refractories
- 6-3. Increasing the temperature of a furnace at an excessively rapid rate is likely to result in what type of problem?
1. Burner cone sag
 2. Anchor bolt shrinkage
 3. Firebrick breakage at the anchor bolts
 4. Deep firebrick fractures
- 6-4. An improperly closed expansion joint has which of the following indications?
1. Excessive slag formation near the joint
 2. A light discolored surface inside the joint
 3. Deep fissures in the firebrick adjacent to the joint
 4. A dark discolored surface inside the joint
- 6-5. A plastic burner front is inspected after its first firing period. Which of the following conditions indicate(s) defective workmanship?
1. Radial cracks only
 2. Parallel cracks only
 3. Radial and parallel cracks
 4. Fallen slabs of plastic from the burner front surface
- 6-6. What are the two most likely causes of failure in a castable burner front surface that has recently been installed?
1. Partial set of the material before installation and too much water in mixing
 2. Too much water in mixing and long storage in a place that is too dry
 3. Too little water in mixing and long storage in a place that is too dry
 4. Partial set of the material before installation and too little water in mixing
- 6-7. What condition(s) contribute(s) to the damage of boiler refractories?
1. Poor boiler operating procedures only
 2. Severe boiler operating conditions only
 3. Poor boiler operating procedures or severe boiler operating conditions
 4. Failure to remove all crumbly material from a castable burner front when installed
- 6-8. Under which, if any, of the following conditions may a boiler be steamed with married tubes?
1. The married tubes are 1 inch in diameter, are located in the main generating bank, and are tight under hydrostatic test
 2. The married tubes are 2 inches in diameter and are located in the fire row
 3. The married tubes are 1 inch in diameter, are located in the main tube bank, and leave a gas passage of 2 inches to the superheater
 4. None of the above

Tube Defect	Appearance	Usual Causes	Typical Locations
Circumferential grooving	Bands or strips around the circumference	1. Tube seat leakage 2. Dampened soot deposits on horizontal drums or headers	1. Header ends of horizontal tubes 2. Vertical generating tubes
A	Deep, irregular, straight-walled cavities	1. Leakage of water entrapped between tube metal and surrounding refractory 2. Improper drying of boiler firesides after washing	Header ends of waterwall tubes and division wall tubes that are surrounded by refractory
B	Wandering, straight-walled, canyonlike cavities	1. Leakage of water entrapped between tube metal and surrounding refractory 2. Improper drying of boiler firesides after washing	Header ends of waterwall tubes and division wall tubes that are surrounded by refractory
General fireside thinning	Uniform loss of metal over a relatively large area	G	1. Superheater tube ends between headers and seal plates 2. Water drum ends of generating tubes
C	E	1. Waterside deposits 2. Dry or steam-bound tube	Anywhere
D	F	Steam jets	Anywhere

Figure 6A

IN ANSWERING QUESTIONS 6-12 THROUGH 6-17, REFER TO FIGURE 6A.

6-9. When a blistered tube suggests a waterside deposit, the nature and extent of this deposit can be determined in what manner?

1. By punching the tube with tube cleaning equipment and inspecting the substance loosened by the wire brush
2. By hitting the blister a sharp blow with a hammer and inspecting the particles knocked loose
3. By removing the tube and an adjacent tube, splitting both, and comparing them
4. By removing the tube, splitting it, and examining the watersides of the blistered tube

6-10. By what means can you measure the amount of enlargement of a tube if calipers are not available to you?

1. A micrometer
2. A section of string and a ruler
3. A depth gauge
4. A straight pin through a 3- by 5-inch card

6-11. What is the most common cause of circumferential grooving on a superheater?

1. Leaking of the economizer plugs
2. Leaking of the tube seats in the top pass of the superheater
3. Soot deposits around the tubes where they enter the headers
4. Water washing the firesides without properly drying them

6-12. What tube defects should be entered in spaces A and B?

1. Craters and water tracks
2. Fireside burning and craters
3. Steam gouging and fireside burning
4. Water tracks and steam gouging

6-13. At what point does cratering and water tracking occur almost exclusively?

1. On the fire row tubes
2. On the tube ends at the water drum
3. At the header ends of the waterwall tubes
4. At the steam end of the waterwall tubes

6-14. What information should be entered in space G?

1. Tube seat leakage
2. Soot or vanadium corrosion
3. Improper drying of boiler firesides after washing
4. Steam jets

6-15. What appearance should be entered in space F?

1. Irregular, smooth-surfaced cavities
2. Coarse, brittle tube metal
3. Uniform loss of metal over a small area
4. Bands around the circumference

6-16. What tube defects should be entered in spaces C and D?

1. Craters and steam gouging
2. Fireside burning and steam gouging
3. Steam gouging and water tracks
4. Water tracks and craters

6-17. What appearance should be entered in space E?

1. Irregular, smooth-surface cavities
2. Coarse, brittle tube metal
3. Uniform loss of metal over a small area
4. Irregular, straight-wall cavities

IN ANSWERING QUESTIONS 6-18 THROUGH 6-21, REFER TO FIGURE 6B.

6-18. What casualties are NOT necessarily caused by overheating?

1. A, C
2. A, E
3. B, D
4. C, E

6-19. What casualty is caused by the most severe overheating?

1. A
2. B
3. D
4. E

6-20. What type of rupture is common in generating tubes?

1. B
2. C
3. D
4. E

6-21. What casualty results from the least severe overheating?

1. B
2. C
3. D
4. E

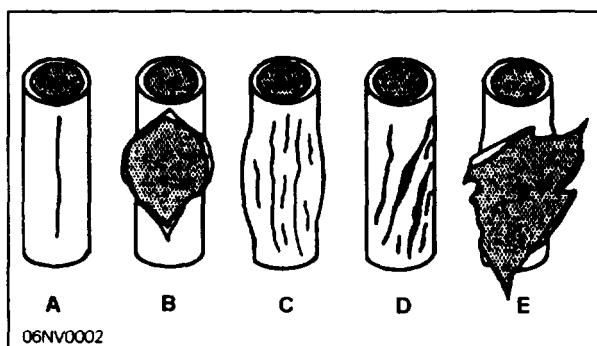


Figure 6B

BOILER TUBE DEFORMITIES

- A. Melting
- B. Warping
- C. Sagging
- D. Cracking

Figure 6C

IN ANSWERING QUESTIONS 6-22 THROUGH 6-25,
REFER TO FIGURE 6C.

- 6-22. Very mild overheating for a short period of time:
- 1. A
 - 2. B
 - 3. C
 - 4. D
- 6-23. Caused by a mechanical process, such as flexing:
- 1. A
 - 2. B
 - 3. C
 - 4. D
- 6-24. Low water for an extended period of time at high furnace temperatures:
- 1. D
 - 2. C
 - 3. B
 - 4. A
- 6-25. Sudden cooling of overheated tubes:
- 1. D
 - 2. C
 - 3. B
 - 4. A
- 6-26. Improper fabrication of tubes is most likely to result in which of the following conditions?
- 1. Upset tubes
 - 2. Swaging
 - 3. Wall lamination
 - 4. Mechanical fatigue cracks
- 6-27. The basic reason for tube failure caused by fireside and waterside deposits is that the deposits result in which of the following conditions?
- 1. Oxygen pitting
 - 2. Tube wall lamination
 - 3. Localized overheating
 - 4. Tube abrasion
- 6-28. Abundant water combining with soot on firesides of tubes may result in the formation of what substance?
- 1. Slag
 - 2. Iron oxide
 - 3. Ferrous sulfate
 - 4. Saltlike granules
- 6-29. Steam drum protection plates are most likely to be damaged when what condition exists?
- 1. Gas passages are clogged
 - 2. Superheater is overfired
 - 3. Steam pressure is formed too fast
 - 4. Brickwork adjacent to the superheater headers is damaged
- 6-30. When testing the functions of automatically or manually controlled devices that interfere with steam distribution, you should ensure that which of the following main distribution valves is/are closed?
- 1. Gas only
 - 2. Gas and water
 - 3. Main steam
 - 4. Water and steam
- 6-31. When CO₂ or O₂ measuring devices are not available, you can use which of the following indications as a guide for checking the air-fuel ratio on a small boiler?
- 1. Fuel consumption
 - 2. Draft gauge
 - 3. Feedwater consumption
 - 4. Appearance of the fire

- 6-32. On a fully automatic boiler, you can check the flame failure and combustion air failure devices in which of the following ways?
1. By simulating a flame failure manually
 2. By observing the complete programmed sequence cycle
 3. By simulating a low-water condition
 4. By bypassing the draft controller
- 6-33. With respect to steam and water piping, you should look for which of the following conditions during an inspection?
1. Excessive expansion and contraction
 2. Undue vibration in piping connections to the boiler
 3. Leaking water column connections
 4. Each of the above
- 6-34. What is the best method for determining proper operation of high- and low-water alarms?
1. Open the surface blowdown valve momentarily
 2. Blow down the water column with steam on the boiler only
 3. Observe the action of the water during blowdown of the gauge glass only
 4. Blow down the water column with steam on the boiler and observe the action of the water during blowdown of the gauge glass
- 6-35. Of the following steps, which one should you take to test the operation of a float-activated low-water fuel cutoff device?
1. Drain the float bowl to the low-water level
 2. Close the fuel oil solenoid valve
 3. Blow down the steam drum
 4. Disconnect the low-water control circuitry
- 6-36. Normally, a temperature controlled low-water fuel cutoff device responds to an increase in temperature inside the boiler under which of the following circumstances?
1. Stack temperature is excessively high
 2. Water drops to a predetermined level
 3. Steam pressure is no more than 2 percent above normal
 4. Water temperature rises uniformly to the steaming level
- 6-37. When testing blowoff valves, you should open the valves for a few seconds to check for which of the following conditions?
1. Back pressure
 2. Valve wear only
 3. Restrictions only
 4. Valve wear and restrictions
- 6-38. To check the blowoff setting of safety valves and water-pressure relief valves, you should perform which, if any, of the following actions?
1. Raise boiler pressure slowly to the blowoff pressure
 2. Manually raise the valve
 3. Gag all safety and relief valves
 4. None of the above
- 6-39. A properly functioning single safety valve on a steam boiler that has a maximum allowable working pressure of 150 psi should reseal tightly at what minimum pressure?
1. 144 psi
 2. 124 psi
 3. 104 psi
 4. 84 psi
- 6-40. What should be the individual settings of two pressure relief valves on a hot-water boiler having a maximum allowable working pressure of 100 psi?
1. One at 125 psi, the other at 100 psi maximum
 2. Both at 110 psi
 3. One at 150 psi, the other at 110 psi
 4. One at 120 psi maximum, the other at 100 psi
- 6-41. A properly set single, pressure relief valve on a boiler with a maximum allowable working pressure of 80 psi should reseal tightly with a blowdown of what maximum pressure?
1. 15 psi
 2. 20 psi
 3. 25 psi
 4. 30 psi

- 6-42. Under certain conditions, which of the following factors can be used to determine safety valve capacity?
1. Operating pressure
 2. Maximum steam generating capacity only
 3. Maximum evaporative capacity only
 4. Maximum steam generating capacity or maximum evaporative capacity
- 6-43. Venting should be held to a minimum to preclude what condition in the feedwater?
1. Deaerator venting
 2. Hydrogen entrainment
 3. Oxygen entrainment
 4. Oxygen venting
- 6-44. As a boiler plant supervisor, you should be able to identify which of the following indications of trouble?
1. Strange noises
 2. Unusual vibrations
 3. Abnormal temperatures
 4. Each of the above

LOG ENTRIES
A. Steam Pressure
B. Steam flow
C. Feedwater pump
D. Feedwater pressure

Figure 6D

IN ANSWERING QUESTIONS 6-45 THROUGH 6-47, REFER TO FIGURE 6D.

- 6-45. Actual output recorded in pounds per hour to obtain steam flow:
1. A
 2. B
 3. C
 4. D

- 6-46. Proper deaerating temperature being maintained in the heater:
1. A
 2. B
 3. C
 4. D
- 6-47. Effectiveness of the boiler feed pumps:
1. D
 2. C
 3. B
 4. A
- 6-48. With other conditions constant, a decrease in what type of draft indicates leaking baffles?
1. Last pass
 2. Mechanical
 3. Forced
 4. Furnace
- 6-49. What reading(s) is/are an indication that heat is being lost by way of the stack?
1. Percentage of CO₂ flue gas
 2. Flue-gas temperature
 3. Soot-blown time and blowdown
 4. Hot-water supply temperature and blowdown
- 6-50. What type(s) of fuel consumption is/are determined by use of a measuring stick?
1. Gallons of oil
 2. Pounds of coal only
 3. Cubic feet of gas only
 4. Pounds of coal and cubic feet of gas
- 6-51. The hot-water supply temperature should be recorded because insufficiently heated water can cause which of the following conditions?
1. Abnormal soot deposits
 2. Hammer knock in a steaming boiler
 3. Deposits or scaling in a boiler
 4. Large amounts of chemicals to accumulate in the feedwater
- 6-52. In what log column should you record the date a boiler was drained and washed?
1. Remarks
 2. Makeup water
 3. Water pressure
 4. Soot-blown time and blowdown

- 6-53. An operator coming on duty should perform an operational inspection for which of the following reasons?
1. To ensure the boiler water level is correct
 2. To ensure the system is operating normally
 3. To ensure sufficient fuel is available
 4. To ensure the boiler room is clean
- 6-54. The technical library should contain current Navy publications pertaining to your boiler plant and which, if any, of the following manuals?
1. Specific plant manufacturer's manual
 2. General plant manufacturer's manual
 3. Army boiler operation and repair technical manuals
 4. None of the above
- 6-55. What term is commonly used to describe the universal solvent?
1. Oxygen
 2. Water
 3. Sodium phosphate
 4. Caustic soda
- 6-56. A glass of tap water at 77°F contains a total of how many ppm of oxygen?
1. 7.5
 2. 7.8
 3. 8.2
 4. 9.0
- 6-57. To prevent corrosion damage to metal in the interior of the boiler, you should perform which of the following actions?
1. Paint the interior metal surfaces
 2. Chemically treat the feedwater only
 3. Chemically treat the boiler water only
 4. Chemically treat the feedwater and the boiler water
- 6-58. What is the term used for deposits on tubes and other internal surfaces caused by calcium salts, magnesium salts, and other insoluble materials?
1. Deposits
 2. Scales
 3. Crystals
 4. Solids
- 6-59. Chemical treatment of boiler water causes scale-forming substances in what form?
1. Scale deposits
 2. Fluid sludge
 3. Carbonate of sulfate
 4. Caustic soda
- 6-60. When required to treat boiler water containing calcium, you should use what chemical?
1. Sodium phosphate
 2. Calcium phosphate
 3. Calcium silicate
 4. Sodium silicate
- 6-61. What sludge conditioner is the only dispersant approved by NAVFAC?
1. Magnesium silicate
 2. Calcium sulfate
 3. Sodium phosphate
 4. Quebracho tannin
- 6-62. A small amount of seawater in the feedwater causes which, if any, of the following conditions inside a boiler?
1. Steam carry-over
 2. Baked sludge
 3. Heavy sludge
 4. None of the above
- 6-63. What chemical should you add to boiler water to raise the pH value?
1. Iron oxide
 2. Caustic soda
 3. Sodium sulfite
 4. Tannin
- 6-64. What chemical is often referred to as an oxygen scavenger?
1. Iron oxide
 2. Caustic soda
 3. Sodium sulfite
 4. Tannin
- 6-65. Feedwater or makeup water tanks should be maintained within what temperature range?
1. 125°F to 135°F
 2. 140°F to 160°F
 3. 165°F to 175°F
 4. 180°F to 200°F

6-66. The production of froth or unbroken bubbles on the surface of the boiler water is known by what term?

1. Foaming
2. Steam production
3. Alkalinity
4. Scum

6-67. What condition(s) in a boiler make(s) it difficult, or quite often impossible, to read the true level of boiler water on the gauge glass?

1. Foaming only
2. Priming only
3. Foaming or priming
4. Bumping or priming

6-68. What two types of solids are present in most boiler water?

1. Dissolved and gloating
2. Suspended and floating
3. Dissolved and scale-forming
4. Suspended and dissolved

6-69. The continuous blowdown should be regulated to maintain what ppm of TDS in a steaming boiler?

1. 2,000 to 3,000
2. 3,000 to 4,000
3. 4,000 to 5,000
4. 5,000 to 6,000

6-70. One boiler horsepower produces a total of how many pounds of steam per hour?

1. 3.450
2. 34.50
3. 345.0
4. 3,450

6-71. Once the boiler has stabilized and treatment test results remain reasonably balanced, you should conduct testing at what intervals, in hours?

1. 1
2. 2
3. 3
4. 4

ASSIGNMENT 7

Textbook Assignment: "Boilers," "Duct and Ventilation Systems," and "Air Conditioning and Refrigeration."
Pages 12-38 through 14-26.

- 7-1. What person is the most important member of a boiler maintenance team?
1. The supervisor
 2. The welder
 3. The laboratory technician
 4. The operator
- 7-2. Any unusual temperature change the operator cannot correct should be reported to what individual?
1. Plant supervisor
 2. Watch chief
 3. Relief operator
 4. Maintenance supervisor
- 7-3. What is the main purpose for conducting preventive maintenance inspections?
1. To keep the equipment in good operating condition
 2. To anticipate and prevent equipment breakdown
 3. To repair broken equipment
 4. To keep an accurate maintenance record of all equipment
- 7-4. Refer to table 12-4. What draft reading is recommended in an oil burner firebox?
1. 1.0 inch
 2. 2.0 inches
 3. 0.01 inch
 4. 0.02 inch
- 7-5. When soot combines with moisture, what is the result?
1. Slag
 2. Sulfur dioxide
 3. Sulfuric acid
 4. Hydrogen sulfide
- 7-6. When left untended, soot corrosion on boiler metals causes which of the following problems?
1. Extensive deterioration
 2. High fuel cost
 3. High operating cost
 4. Dirty steam
- 7-7. Soot and other deposits left on boiler brickwork lower the melting point of which of the following components?
1. Boiler tubes
 2. Headers
 3. Refractories
 4. Burners
- 7-8. Failure to keep boiler watersides clean can result in which of the following conditions?
1. Dirty steam
 2. Overheating
 3. Carry-over
 4. Low temperature
- 7-9. What condition often signals the need for waterside and fireside cleaning?
1. Lowering of stack gas temperature
 2. Lowering of steam temperature
 3. Rise in stack gas temperature
 4. Rise in steam temperature
- 7-10. When preparing to work on watersides, what must you do concerning tools and equipment?
1. Sparkproof the metal tools
 2. Clean and wipe each tool dry
 3. Inventory and tag the tools
 4. Inventory the tools and prepare an in/out sheet
- 7-11. What special type of extension light, if any, is authorized inside a boiler?
1. Explosionproof
 2. Dustproof
 3. Watertight glove
 4. None

7-12. When work on the watersides of a boiler is being performed, a person should be stationed outside the boiler for what sole purpose?

1. To act as tender only
2. To assist workers in the boiler only
3. To act as tender and to assist workers in the boiler
4. To perform first aid if necessary

7-13. What two methods can be used to boil out the watersides of a boiler?

1. Sodium metasilicate pentahydrate and trisodium silicate
2. Sodium pentahydrate and sulfuric acid
3. Sodium silicate and trisodium metasilicate pentahydrate
4. Sodium metasilicate pentahydrate and trisodium phosphate

7-14. In the wet lay-up method, you should add what chemical to the water?

1. Sodium sulfite
2. Sodium hydroxide
3. Sodium silicate
4. Sodium electrolyte

7-15. In the wet lay-up method, 0.03-0.06 pounds of sodium sulfite should be added per how many gallons of water?

1. 30
2. 50
3. 100
4. 1,000

7-16. At what interval should water in an idle boiler be sampled and analyzed?

1. Daily
2. Weekly
3. Monthly
4. Quarterly

7-17. In the dry lay-up method, a minimum of how many pounds of quicklime should be used as a drying agent per 100 boiler horsepower?

1. 5
2. 10
3. 20
4. 40

7-18. A high-pressure or high-velocity ductwork system has a fan that operates within what static-pressure range?

1. 1 inch to 5 inches WC
2. 2 inches to 6 inches WC
3. 3 inches to 7 inches WC
4. 4 inches to 8 inches WC

7-19. Duct velocities greater than how many feet per minute (fpm) are normally unwarranted?

1. 2,000
2. 3,000
3. 4,000
4. 6,000

7-20. In a low-velocity system, the duct velocity is normally less than how many feet per minute?

1. 2,000
2. 1,500
3. 1,000
4. 500

7-21. What type of duct system is no longer legal?

1. Fiber glass
2. Asbestos
3. Sheet metal
4. Aluminum

7-22. When possible, you should use what shape of duct system ?

1. Square
2. Rectangular
3. Round
4. Trapezoidal

7-23. What is/are the primary disadvantage(s) of a double-duct system?

1. Unstable air quantities
2. High air velocities only
3. Unstable duct pressures only
4. High air velocities and unstable duct pressures

7-24. The type of material used for duct lining and covering must have what characteristic?

1. It must be nonbacteriological
2. It must be noncombustible
3. It must be sound absorbent
4. It must be inflexible

7-25. The power required by the fan for delivering air at a given quantity increases rapidly according to what change, if any, in duct size?

1. An increase only
2. A decrease only
3. An increase or a decrease
4. None

7-26. Rectangular fiber-glass ducts 24 inches or less in diameter must be supported every how many feet?

1. 10
2. 8
3. 6
4. 4

7-27. What type of joint is used to absorb expansion and contraction in a duct system?

1. Accordion
2. Bellows
3. Shiplap
4. Fabric

7-28. When computing duct size, you should first perform what calculation?

1. Air pressure
2. Air volume
3. Air velocity
4. Air movement

7-29. You can gain efficiency by installing what type of elbow in a duct system?

1. Long, sweeping
2. Short, 90 degree
3. Unidirectional
4. S curve

7-30. Short, 90-degree elbows can be used effectively in which of the following locations within an air duct system?

1. Before registers only
2. Before diffusers only
3. Before grilles only
4. Before registers, diffusers, and grilles

7-31. When designing a duct system, you should use what publication as a source of technical information?

1. Mechanical Engineering Manual
2. Duct Design and Fabrication
3. Construction Engineering Handbook
4. ASHRAE Handbook of Fundamentals

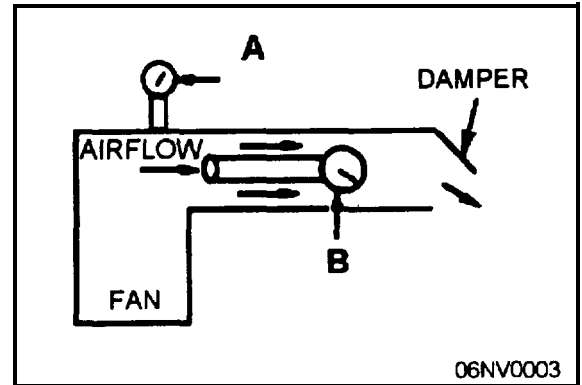


Figure 7A

IN ANSWERING QUESTIONS 7-32 AND 7-33, REFER TO FIGURE 7A.

7-32. The total pressure of the duct system is equal to the pressure reading of what gauge(s)?

1. A only
2. B only
3. B plus A
4. B minus A

7-33. The velocity pressure of the duct system is equal to the pressure reading of what gauge(s)?

1. A plus B
2. A only
3. A minus B
4. B minus A

7-34. A newly installed duct system is balanced in what manner?

1. By adjusting the speed of the fan
2. By drilling small holes in branch holes
3. By adjusting air outlets to the design rate of flow
4. By installing dampers in the main duct

- 7-35. What is the main purpose of pressure measurements after a newly installed system is balanced and operating properly?
1. To check the design of the system
 2. To provide information for required reports
 3. To provide information for future tests
 4. To ensure proper adjustment of the fan and air outlets

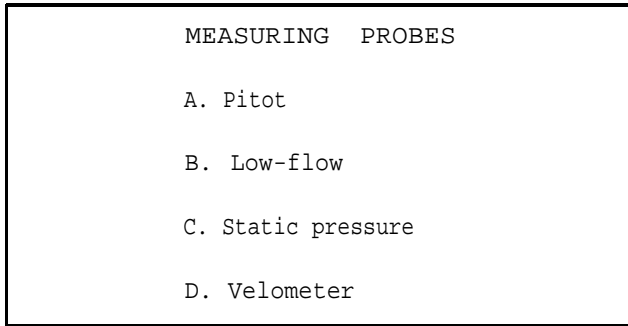


Figure 7B

IN ANSWERING QUESTIONS 7-36 THROUGH 7-38, REFER TO FIGURE 7B.

- 7-36. Measures air currents in open spaces:

1. A
2. B
3. C
4. D

- 7-37. Measures pressure drop across blowers in duct systems:

1. A
2. B
3. C
4. D

- 7-38. Measures internal air velocities in duct systems:

1. D
2. C
3. B
4. A

- 7-39. When used in conjunction with the diffuser probe, what device permits the rapid change of measuring ranges without shifting to separate jets for different velocities?

1. Manometer
2. Range selector
3. Tachometer
4. Anemometer

- 7-40. Which of the following is NOT a unit by which a manometer measures air pressure?

1. Pounds per square inch
2. Inches of mercury
3. Inches of water
4. Cubic feet per minute

- 7-41. One of the preliminary steps in air-balancing operations is to prepare a working sketch of the system. Which of the following items should be included in the sketch?

1. Duct dimensions
2. Air flow volumes and velocities
3. Air-delivery design of each outlet and type of diffuser
4. Each of the above

- 7-42. When balancing an air distribution system, you should first determine fan performance for which of the following reasons?

1. To pinpoint problems caused by blockages in the duct system
2. To ensure the fan is rotating correctly
3. To ensure that sufficient static pressure and air volume are being handled at the fan
4. To ascertain whether the air filters are clean

- 7-43. What factors influence the performance of a fan in a ventilation system?

1. Static pressure and rpm of the fan
2. Voltage and amperage of the fan motor
3. Total airflow in the ventilation system
4. Each of the above

- 7-44. What instruments are used to measure the static pressure of an operating fan?
1. Velometer and static-pressure probe
 2. Rotating vane anemometer and low-flow probe
 3. Velometer and Pitot tube
 4. Manometer and diffuser probe
- 7-45. Which of the following air distribution problems in ducts can be located quickly by measuring static pressure?
1. Leakage
 2. Blockage
 3. Slippage
 4. Each of the above
- 7-46. Velocity pressure readings should be taken to determine the total air volume of a fan from which, if any, of the following areas?
1. Fan suction
 2. Fan distribution spaces
 3. Downstream of the fan in an area with minimum turbulence
 4. None of the above
- 7-47. Velocity pressure readings should be taken at what location inside a rectangular duct?
1. Along the perimeter at equal intervals
 2. From the center of equally divided areas of the cross section
 3. Along the horizontal center line at equal intervals
 4. At any accessible location
- 7-48. When the average velocity pressure is 120 fpm and the cross-sectional measurements are 18 inches by 24 inches, what is the total airflow, in cfm, within the duct?
1. 120
 2. 270
 3. 320
 4. 360
- 7-49. The measured total air flow, in cfm, should exceed the design cfm by approximately 10 percent for which of the following reasons?
1. To allow for slippage
 2. To ensure maximum fan speed
 3. To allow for leakage
 4. Each of the above
- 7-50. At what location, in respect to the duct configuration, should the final balancing procedure be started?
1. Downstream of the main air return
 2. In the immediate area of the fan discharge
 3. At the last outlet on the farthest branch from the fan discharge
 4. In the largest spaces served by the duct
- 7-51. During the final balancing procedure, an air outlet that should be discharging 90 cfm is found to be discharging 125 cfm. Which of the following actions should you take?
1. Leave the damper open and proceed to the next outlet
 2. Adjust the damper until the output drops to 90 cfm
 3. Decrease the fan speed
 4. Restrict the flow of return air
- 7-52. What term is commonly used to identify fresh air leakage into a building or room?
1. Infiltration
 2. Exfiltration
 3. Ventilation
 4. Defiltration
- 7-53. A minimum amount of how much fresh air is necessary to provide sufficient oxygen and to remove carbon dioxide for each person in a typical office space?
1. 8 cfm
 2. 2 cfm
 3. 6 cfm
 4. 4 cfm

7-54. A total of how many changes of air per hour is required for a conditioned space in a residence during the heating season?

1. One
2. Two
3. Three
4. Four

7-55. A sleeping person gives off approximately how many Btu per hour of heat?

1. 50
2. 100
3. 150
4. 200

7-56. When installing a natural ventilation system, you should consider location and what other factor regarding ventilation openings?

1. Wind
2. Control
3. Humidity
4. Temperature

7-57. You should use mechanical ventilation equipment under which, if any, of the following circumstances?

1. The outside air is high in humidity
2. The outside air has a high ambient temperature
3. The outside air cannot be supplied continually by natural forces
4. None of the above

7-58. When areas to be air-conditioned are in close proximity to each other, you should use what type of air-conditioning system?

1. Chilled water only
2. Hot and chilled water
3. Forced air
4. Natural draft

7-59. What type of air-conditioning system is recommended for use in a hospital?

1. Chilled water only
2. Hot and chilled water
3. Forced air
4. Natural draft

7-60. In heat load calculations, what factor denotes heat leakage?

1. H
2. K
3. P
4. R

7-61. In heat load calculations, what factor denotes insulation values?

1. R
2. P
3. K
4. H

7-62. When working on an ammonia-absorption refrigeration system, you need what type of manifold gauges?

1. Brass
2. Copper
3. Steel
4. Bronze

7-63. An expendable evaporator system works within what temperature range?

1. 32°F to 0°F
2. 15°F to -5°F
3. 10°F to -10°F
4. -20°F to 60°F

7-64. When you want to preserve the freshness of fruits and vegetables, you should use what type of evaporator system?

1. Expendable
2. Eutectic
3. Spray
4. Thermoelectric

7-65. What type of refrigeration system has no moving parts?

1. Expendable
2. Eutectic
3. Spray
4. Thermoelectric

7-66. What maximum temperature can be maintained in a cascade refrigeration system?

1. - 50°F
2. -100°F
3. -150°F
4. -250°F

7-67. What maximum temperature can be attained in a three-stage compound system?

1. -80°F
2. -135°F
3. -150°F
4. -250°F

7-68. Refer to figure 14-22B. The pressure at P1 is 7 pounds, P2 is 4 pounds, and P3 is 21 pounds. The valve is in what position?

1. Equilibrium
2. Closed
3. Open
4. None of the above

7-69. An external equilizer line is required when what pressure drop exists across an evaporator coil?

1. 1 pound
2. 5 pounds
3. 3 pounds
4. 7 pounds

7-70. When adjusting a thermal expansion valve, you must make how many turns of the valve stem at each interval?

1. One
2. Two
3. Three
4. Four

7-71. Of the following considerations, which one is most important when you are mounting a condenser on a roof?

1. The roof load strength
2. The noise level
3. The availability of water
4. The availability of electricity

7-72. What types of metal are used in a bi-metal thermostat?

1. Tin and antimony
2. Tin and steel
3. Copper and steel
4. Brass and invar

7-73. What type of thermostat uses 115 volts?

1. Line voltage
2. Low voltage
3. Millivoltage
4. High voltage

7-74. What is the most commonly used metering device?

1. The AEX
2. The capillary tube
3. The TEV
4. The low-side float

7-75. The additional starting torque of a capacitor-start, induction-run motor over that of a split-phase motor is provided by a

1. run capacitor in parallel with the start winding
2. start capacitor in series with the run winding
3. run capacitor in parallel with the run winding
4. start capacitor in series with the start winding

ASSIGNMENT 8

Textbook Assignment: "Air Conditioning and Refrigeration," "Solar Energy," and "Environmental Pollution Control."
Pages 14-17 through 16-3.

- 8-1. Which of the following types of motors should be used for a 5-horsepower, high-starting torque requirement?
1. Split-phase
 2. Capacitor-start, capacitor-run
 3. Permanent split-phase
 4. Capacitor-start, induction-run
- 8-2. The permanent split-phase motor circuit differs from a split-phase in which, if any, of the following ways?
1. It requires a start capacitor in series with the start winding
 2. It uses a run capacitor in series with the start winding
 3. It requires a start relay
 4. None of the above
- 8-3. Start windings are used in single-phase motors designed for use with hermetic refrigeration for which of the following reasons?
1. The motors start under load conditions
 2. The compressors are operated at two speeds
 3. The motors start under no-load conditions
 4. The start winding is a standby winding
- 8-4. The opposition to the flow of alternating current caused by the inductance and capacitance in the run winding is a result of
1. low reactance
 2. high reactance
 3. low resistance
 4. high resistance
- 8-5. When using an ohmmeter to identify motor terminals, you should perform what action first?
1. Remove the wires connected to the terminal
 2. Mark the wires for later identification
 3. Remove power to the motor circuit
 4. Disconnect the ground
- IN ANSWERING QUESTIONS 8-6 THROUGH 8-8, REFER TO FIGURE 14-30. ASSUME THE METER IS FUNCTIONING PROPERLY.
- 8-6. The R to S test indicates that the remaining terminal is the common terminal because the resistance of
1. the run winding is high
 2. both windings in parallel are high
 3. the start winding is low
 4. both windings in series are high
- 8-7. The C to S test indicates that the remaining terminal is the run terminal for which, if any, of the following reasons?
1. It has the greatest resistance
 2. It has a much lower resistance
 3. It has the same resistance
 4. It has medium resistance
- 8-8. If, during either the R to S or the C to S test, the ohmmeter needle fails to move, you should check for what problem?
1. An open start relay
 2. A defective winding
 3. An open run capacitor
 4. A shorted start capacitor
- 8-9. Which of the following components is considered a load?
1. Thermostat
 2. High-pressure switch
 3. Set of contacts
 4. Coil of a contactor
- 8-10. An ohmmeter shows a resistance of infinity between the R and C motor terminals during a continuity test. Which of the following faults is indicated?
1. A grounded run winding
 2. An open start winding
 3. A shorted start winding
 4. An open run winding

- 8-11. Assume that you are using a test lamp to check the continuity between the C and S terminals of a motor. What fault is indicated when the light fails to come on?
1. An open in the start winding
 2. A short in the start winding
 3. An open in the run winding
 4. A short in the run winding
- 8-12. Which of the following conditions exists in the case of a shorted winding?
1. A wire is burned in half
 2. The winding has a high resistance
 3. A loop of copper wire is in contact with another wire
 4. A wire is touching the hermetic shell
- 8-13. An ohmmeter indicates a start winding resistance of 4 ohms for a motor that has a run winding resistance of 2.5 ohms. The low resistance of the motor start winding is most likely due to what fault?
1. An open
 2. A short
 3. A grounded start capacitor
 4. A burned current relay
- 8-14. Refer to figure 14-33. What fault is indicated by continuity between one of the motor terminals and the shell?
1. A short
 2. An open
 3. A ground
 4. An overload
- 8-15. Which of the following devices can be used to test a hermetic motor for grounds?
1. Ohmmeter
 2. Test lamp
 3. Megger
 4. Each of the above
- 8-16. Refer to figure 14-26. At what time should the contact points be in the open position?
1. The off-cycle only
 2. The start winding is de-energized
 3. The motor reaches about three-fourths rated speed
 4. Each of the above
- 8-17. Unlike the current relay that responds to starting current in the motor circuit, the voltage relay responds to which, if any, of the following conditions?
1. Current flow through the run winding only
 2. Voltage induced in the start winding
 3. Leveling effect of the run capacitor
 4. None of the above
- 8-18. When the circuit draws excessive current, which of the following starting relays is capable of de-energizing the running winding circuit?
1. Hot wire
 2. Voltage
 3. Current
 4. Each of the above
- 8-19. Refer to figure 14-38. When an overload protector is open, the opening action is the direct result of what condition?
1. Voltage
 2. Heat
 3. Current
 4. Capacitance
- 8-20. What device, if any, is used in the starting circuit of an induction motor to provide leading current through one winding?
1. Overload protector
 2. Starting capacitor
 3. Running capacitor
 4. None
- 8-21. Assume that you are testing the contacts of a voltage-type starting relay with an ohmmeter. The normally closed contacts are working properly in which of the following circumstances?
1. Contacts lack continuity
 2. Negligible resistance exists in the relay coil
 3. Current is not flowing through the contacts
 4. Continuity exists through the contacts

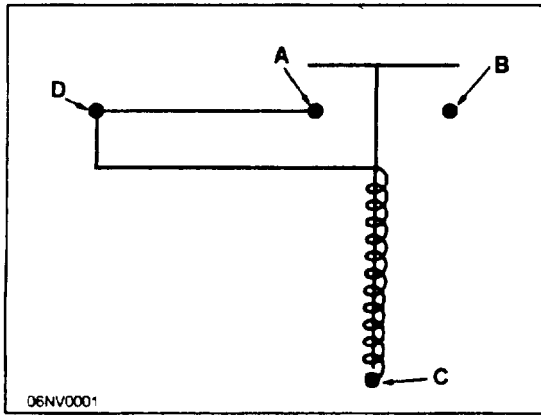


Figure 8A

IN ANSWERING QUESTIONS 8-22 THROUGH 8-24, REFER TO FIGURE 8A.

8-22. At what points should an ohmmeter be connected to test the relay coil?

1. A and B
2. B and C
3. C and D
4. D and B

8-23. At what points should an ohmmeter be connected to test the relay contacts?

1. A and B
2. B and D
3. C and B
4. D and C

8-24. Which of the following ohmmeter test results indicates the contacts of a current relay are satisfactory?

1. Continuity through points A and B
2. Lack of continuity through points A and C only
3. Lack of continuity through points A and B only
4. Lack of continuity through points A, B, and C

8-25. Refer to figure 14-40. Assuming the test is accomplished, which of the following meter readings indicates an open coil?

1. 110 volts
2. 2 ohms
3. Infinity
4. 4 amps

8-26. When a starting relay fails, you can start the compressor motor by bypassing the relay manually using which of the following devices?

1. A test lamp and cable
2. An ohmmeter with four lead wires
3. A test line cord, fuse, and capacitor
4. A jumper placed across terminals C and R and a test lamp

8-27. Which, if any, of the following circuit conditions indicates an internal current temperature overload protector is open in a hermetic motor?

1. Continuity across C and S, C and R, and S and R
2. Open across C and S, C and R, and continuity across S and R
3. Continuity across C and R, and an open across S and R and C and S
4. None of the above

8-28. You are testing a capacitor with an ohmmeter. What general reading on the meter indicates the capacitor is good?

1. Zero resistance and then climbs to high resistance
2. Low resistance
3. Medium resistance

8-29. Which of the following electrical components is NOT part of a load circuit shown in a hermetic system schematic wiring diagram?

1. Compressor motor
2. Start capacitor
3. Thermostat
4. Fan motor

- 8-30. If you are reading voltage across a set of contacts, the contacts are
1. burned
 2. open
 3. shorted
 4. closed
- 8-31. Energy from the sun is received by the earth in what form?
1. Conduction
 2. Radiation
 3. Convection
 4. Diffusion
- 8-32. What term describes the amount of solar energy per unit area per unit of time striking the earth's surface?
1. Solar isolation
 2. Solar radiation
 3. Solar insolation
 4. Solar collection
- 8-33. Which of the following expressions describes the solar constant?
1. 418 Btu/hr-ft²
 2. 2,453 watts/m
 3. 1.940 Langleys/min
 4. Each of the above
- 8-34. What percentage of solar energy is absorbed by the atmosphere?
1. 10% to 20%
 2. 20% to 30%
 3. 30% to 40%
 4. 40% to 50%
- 8-35. What is the average solar intensity in Btu per square foot per day on the ground?
1. 1,200
 2. 1,300
 3. 1,400
 4. 1,500
- 8-36. What is the best and most frequent choice as to the orientation of a solar collector?
1. Grid south
 2. True south
 3. Slightly east of south
 4. Slightly west of south
- 8-37. During what hours of the day does most of the useful energy collection take place?
1. 0700 to 1700
 2. 0800 to 1600
 3. 0900 to 1500
 4. 0900 to 1700
- 8-38. What are the two basic types of solar collectors?
1. Direct and indirect
 2. Oriented and disoriented
 3. Parallel and horizontal
 4. Liquid and air
- 8-39. The absorber plate absorbs solar energy and converts it to which of the following types of energy?
1. Heat
 2. Radiant
 3. Thermal
 4. Electrical
- 8-40. What type of collector is most suitable for low-temperature applications?
1. Air
 2. Liquid
 3. Flat plate
 4. Convex plate
- 8-41. Some collectors are made with a black coating for which of the following reasons?
1. To emit low-frequency infrared radiation
 2. To emit low-frequency ultraviolet radiation
 3. To emit high-frequency incoming solar radiation
 4. To absorb high-frequency incoming solar radiation
- 8-42. What is the most commonly used substance for collector covers?
1. Film
 2. Glass
 3. Plastic
 4. Transparent tape

- 8-43. What is the percentage of transmissivity for standard plate glass?
1. 86%
 2. 76%
 3. 66%
 4. 56%
- 8-44. What is the cheapest and most obtainable collector fluid?
1. Air
 2. Water only
 3. Alcohol only
 4. Water and alcohol
- 8-45. Air is not preferred as the collector fluid in domestic solar water heating for which of the following reasons?
1. It freezes
 2. It corrodes
 3. It has a high density
 4. It has a low-heat capacity
- 8-46. What freeze protection method has a pump to circulate the water through the collectors until the freezing temperatures are over?
1. Drain-up method
 2. Drain-down method
 3. Recirculating method
 4. Supercirculating method
- 8-47. What are the types of heat transfer fluids?
1. Silicones and hydrocarbon oils
 2. Nonaqueous and aqueous
 3. Inhibited distilled water and silicones
 4. Inhibited glycol/water mixtures and hydrocarbon oils
- 8-48. What is the flash point of silicone fluids?
1. 450°F
 2. 400°F
 3. 350°F
 4. 300°F
- 8-49. Silicone fluids are limited to systems with what maximum temperature?
1. 350°F
 2. 400°F
 3. 450°F
 4. 500°F
- 8-50. What substance is added to water to make it a useful collector fluid?
1. Ethylene glycol
 2. Methylene glycol
 3. Silicone glycol
 4. Aluminum glycol
- 8-51. A 50-50 water and glycol mixture will protect against freezing down to about what temperature?
1. -10°F
 2. -20°F
 3. -30°F
 4. -40°F
- 8-52. Which of the following types of collectors uses a vacuum between the absorber and the glass outer tube to reduce convection and conduction heat losses?
1. Evacuated tube
 2. Flat plate
 3. Concentrating
 4. Intensifying
- 8-53. Which of the following types of collectors intercepts direct radiation over a large area and focuses it onto a small absorber area?
1. Evacuated tube
 2. Flat plate
 3. Concentrating
 4. Intensifying
- 8-54. Which of the following collectors collects energy by reflecting direct solar radiation off a large curved mirror and onto a small absorber tube?
1. Linear-trough fresnel lens
 2. Parabolic trough
 3. Compound parabolic mirror
 4. Simple parabolic mirror
- 8-55. Which of the following collectors focuses incoming rays onto a small absorber plate or tube through which the heat transfer liquid is circulated?
1. Linear-trough fresnel lens
 2. Parabolic trough
 3. Compound parabolic mirror
 4. Parabolic fresnel lens

- 8-56. what amount of water storage is needed per square foot of collector?
1. 10 pounds
 2. 15 pounds
 3. 20 pounds
 4. 25 pounds
- 8-57. In air collector systems, latent heat is stored in a material as it changes phase from a
1. liquid to a gas
 2. gas to a liquid
 3. liquid to a solid
 4. solid to a liquid
- 8-58. More expensive, specially fabricated fiber glass or plastic tanks can withstand heat up to what temperature?
1. 450°F
 2. 350°F
 3. 250°F
 4. 150°F
- 8-59. For typical family residences, each person accounts for approximately how many gallons of hot water per day?
1. 10
 2. 20
 3. 30
 4. 40
- 8-60. What is the primary advantage of a thermosiphon system of water storage?
1. It uses a lightweight tank
 2. It needs no pump or controller
 3. It connects directly to the potable water supply
 4. It can use a heat exchanger
- 8-61. What factors contribute to the reduction of heat loss from a rock bed?
1. The density and proclivity
 2. The intensity and range
 3. The conduction and convection is considerable
 4. The conduction and convection is small
- 8-62. What type of heat storage is well suited for warehouses and factories that have mainly daytime operations?
1. No-storage air heating
 2. Rock bed
 3. Air type of space heating
 4. Thermosiphon
- 8-63. Most baseboard heaters require approximately what temperature?
1. 150°F
 2. 160°F
 3. 170°F
 4. 180°F
- 8-64. During the winter, a liquid type of solar system is rarely operated at delivery temperatures above
1. 130°F
 2. 140°F
 3. 150°F
 4. 160°F
- 8-65. The water-to-air heat pump can effectively use heat from solar storage at what temperature?
1. 25°F
 2. 35°F
 3. 45°F
 4. 55°F
- 8-66. Midday collection temperatures are usually within what range?
1. 120°F to 150°F
 2. 130°F to 170°F
 3. 140°F to 160°F
 4. 150°F to 180°F
- 8-67. An oil slick on a water surface blocks the flow of what element from the atmosphere into the water?
1. Hydrogen
 2. Ozone
 3. Oxygen
 4. Carbon dioxide

8-68. On a naval base, what department normally disposes of oil waste residues?

1. PWD
2. DPDO
3. NPDO
4. DDPO

8-69. In what type of approved container should you store oil-soaked absorbent materials for proper disposal?

1. DPDO
2. NPDO
3. APE
4. EPA

8-70. After observing contaminated water from a vehicle washrack polluting the water, you should immediately contact what person?

1. Washrack operator
2. Washrack supervisor
3. Company commander
4. Assistant company commander

8-71. When unburned hydrocarbons and various other fuel components combine chemically, which of the following by-products is normally formed?

1. Carbon monoxide
2. Carbon dioxide
3. Sulfur dioxide
4. Lead sulfite

8-72. What three terms are associated with asbestos dust particle size?

1. Centimeter, millimeter, micron
2. Millimeter, micron, angstrom
3. Centimeter, micron, manometer
4. Micron, nanometer, angstrom

8-73. Air must be scrubbed with a special air filtration machine to remove what size of asbestos dust particles?

1. Millimeter
2. Micron
3. Angstrom
4. Nanometer

8-74. When involved in an asbestos removal project, you should obtain which of the following instructions for guidance?

1. DPDOINST 5100.24
2. OPNAVINST 5100.23
3. OPNAVINST 5110.23
4. OPNAVINST 5200.23

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72	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
73	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
74	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
75	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

THIS FORM MAY BE LOCALLY REPRODUCED

